DOCUMENT RESUME

ED 137 140 SE 022 429

AUTHOR	Coon, Herbert L.; Bowman, Mary Lynne
TITLE	Environmental Education in the Urban Setting: Rationale and Teaching Activities.
INSTITUTION	ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C.
PUB DATE	76
NOTE	199p.
AVAILABLE FROM	Information Reference Center (ERIC/IRC), The Ohio State University, 1200 Chambers Rd., 3rd Floor, Columbus, Ohio 43212 ($4.00)
EDRS PRICE	MF-$0.83 HC-$10.03 Plus Postage.
DESCRIPTORS	Curriculum; *Elementary Secondary Education; *Environment; *Environmental Education; Instruction; *Instructional Materials; Resource Materials; Teaching Guides; *Urban Studies

ABSTRACT

This document has two parts. Part I is a rationale developed to present a point of view about the opportunities for environmental education in urban schools. The premise is that environmental education should be a vital part of the total school program. Part II, Teaching Activities, contains ideas and suggestions for implementing such a program. The activities are designed for student use in grades K-12. Each activity has been classified according to the most appropriate grade level, subject matter, environmental concept involved, and environmental problem area. In addition to being classified in these four categories, each activity contains: (1) a statement of purpose on how the activity may be used, and (2) a reference to a source where the activity may be found in more detail or with variations. (Author/RH)

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ENVIRONMENTAL EDUCATION IN THE URBAN SETTING:

RATIONALE AND TEACHING ACTIVITIES

Rationale by

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Teaching Activities Selected and Developed by

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1976

SE 022 429

ENVIRONMENTAL EDUCATION INFORMATION REPORTS

Environmental Education Information Reports are issued to analyze and summarize information related to the teaching and learning of environmental education. It is hoped that these reviews will provide information for personnel involved in development, ideas for teachers, and indications of trends in environmental education.

Your comments and suggestions for these publications are invited.

John F. Disinger
Associate Director
Environmental Education

Sponsored by the Educational Resources Information Center of the National Institute of Education and The Ohio State University.

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PREFACE

This document is twofold. Part I is a rationale developed to present a point of view about the opportunities for environmental education in urban schools. The overlying premise is that environmental education can be a vital part of the total school program.

Part II, Teaching Activities, are ideas and suggestions for implementing such a program. The activities are designed for student use in grades K through 12. Each activity has been classified by the author according to the most appropriate grade level, subject matter, environmental concept involved, and environmental problem area; the classification systems are given below and on the following pages. In addition to being classified in these four categories, each activity contains (1) a statement of purpose on how the activity may be used, and (2) a reference to a source where the activity may be found in more detail or with variations. (A complete list of all activity references including ERIC document numbers for those materials currently available through the ERIC system is found at the end of Part II.)

It is hoped that the teachers who use these materials will recognize that the classified categories and statement of purpose serve only as a guide in selecting appropriate activities and should not be considered a fixed structure. In fact, it is recommended that teachers check for activities in the other grade level sections that may be appropriate for use or to adapt for use for their own particular set of learners.

CLASSIFICATION OF ENVIRONMENTAL EDUCATION ACTIVITIES

Grade Level:	K - 3	
	4 - 6	
	7 - 9	
	10 - 12	
Subject Area:	Science	including health, nature studies, home economics, etc.
	Mathematics	including arithmetic, geometry, industrial arts, etc.
	Social Studies	including geography, population, history, etc.
	Language Arts	including reading, creative writing, etc.
	Fine Arts	including music, art, theater, etc.

BREAKDOWN OF ACTIVITIES BY CATEGORY
(Some activities fall into more than one subject area.)

	Category	Number of Activities
Grade Level:	K - 3	27
	4 - 6	25
	7 - 9	24
	10 - 12	16
Subject Area:	Science	41
	Mathematics	13
	Social Studies	47
	Language Arts	21
	Fine Arts	12
Concepts:	Bio-physical	26
	Socio-cultural	22
	Management	29
	Change	15
Problem Area:	Aesthetics	26
	Health	32
	Genetics	2
	Eco-community relationships	25
	Psychological/behavioral	8

PROBLEM AREA CLASSIFICATION

modified from Brubaker, Sterling. To Live on Earth. Baltimore: The Johns Hopkins Press, 1972.

I. AESTHETIC CONSIDERATIONS
1. odor
2. air particulate matter - visibility, irritation
3. visual pollution - signs, power lines, billboards, buildings
4. litter
5. noise
6. water quality - taste, odor
7. open spaces - urban and rural
8. city planning and convenience
9. traffic control
10. cultural opportunity
11. recreational facilities

II. HEALTH CONSIDERATIONS
1. disease control - breeding ground control
2. radioactivity
3. air quality - harmful effects (pathogens, chemicals)
4. water quality - harmful effects (pathogens, chemicals)
5. food quality - pesticides, additives
6. medical treatment

III. GENETIC CONSIDERATIONS
1. radioactivity
2. chemicals - air, water, food
3. medical treatment

IV. ECO-COMMUNITY RELATIONSHIPS
1. ecological considerations
2. land use
3. natural resource use
4. energy production
5. urban planning
6. population studies
7. species control (non-human)
8. weather
9. fertilizers and pesticides
10. effects of air quality on ecosystem
11. effects of water quality on ecosystem
12. effects of humans on ecosystems

V. PSYCHOLOGICAL AND BEHAVIORAL CONSIDERATIONS
1. crowding
2. social aspects
3. cultural considerations

CONCEPTS IN ENVIRONMENTAL EDUCATION

from Bowman, Mary Lynne Cox. The Development and Field Validation of an Instrument to Assess College Students' Attitudes Toward the Determinants of Environmental Issues. Unpublished doctoral dissertation, The Ohio State University, Columbus, Ohio, 1972.

I. BIO-PHYSICAL

1. Living things are interdependent with one another and their environment.
2. Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.
3. An organism is the product of its heredity and environment.
4. In any environment, one component--like space, water, air, or food--may become a limiting factor.
5. The natural environment is irreplaceable.

II. SOCIO-CULTURAL

1. The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.
2. The relationships between man and the natural environment are mediated by his culture.
3. Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

III. MANAGEMENT

1. The management of natural resources to meet the needs of successive generations demands long-range planning.
2. Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.
3. Environmental management involves the application of knowledge being applied in a rational direction to achieve a particular objective.

IV. CHANGE

1. Organisms and environments are in constant change.
2. The rate of change in an environment may exceed the rate of organism adaptation.
3. All living things, including man, are continually evolving.
4. Man has been a factor affecting plant and animal succession and environmental processe-.
5. Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

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Social Studies-Fine Arts	2	
Fine Arts	1	
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Fine Arts-Language Arts-Social Studies	2	
Science-Social Studies-Language Arts	1	
Science-Mathematics-Social Studies-Fine Arts	1	
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Science-Language Arts	1	
Social Studies	9	
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Language Arts-Science	1	
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PART I

RATIONALE

by Herbert L. Coon

Herbert L. Coon is a professor in the Faculty of Science and Mathematics Education and a Research Associate at the ERIC Center for Science, Mathematics, and Environmental Education at The Ohio State University. Dr. Coon has an extensive background of experience in curriculum development activities judged to be helpful to public school teachers.

FOREWORD

This statement is designed to be helpful in improving environmental education in urban schools.

Since classroom teachers carry the major burden for implementing program changes, many of the ideas and examples in the material which follows are pointed directly toward them.

Administrators, as they give or withhold support to classroom teachers who attempt to include more environmental education in their programs, are in a position to support change or the status quo. Administrators, particularly building principals, are traditionally key personnel in curriculum change in their buildings and in securing school community support for these changes. Thus, we have directed some suggestions specifically toward administrators.

Teachers and administrators are important only because they are instrumentalities through which individual children may learn and grow. Thus, we have tried to consider several aspects of environmental education from the standpoints of youth enrolled in elementary or high schools. We have suggested the types of learning activities which they regard as most interesting.

School environmental concerns inevitably move quickly into the neighborhood and community. We have offered some suggestions as to how school and community might work together advantageously on these concerns.

From viewpoints which represent those typically held by classroom teachers, administrators, school children, and "the community" we have considered the following:

1. Overview of the problem and present practices.
2. Characteristics of desirable programs in environmental education.
3. Some new promising developments.
4. "Blocks" requiring attention.

Who might find this statement useful?

We expect that classroom teachers, administrators, and some community leaders will find ideas which merit further study. This is particularly likely to be true if they are already convinced philosophically, as we are, that environmental education is a high priority need in our schools and country. It is likely that students, too, might be interested in many of the ideas presented herein, particularly if they sensed a possibility that some of them might be applied to their own education.

While individuals representing the groups mentioned previously might find this statement useful, we urge that program ideas be considered jointly by all groups involved. Students, teachers, administrators, and community leaders working together have an excellent chance of developing a successful program—particularly in a still new area of major concern such as environmental education.

SECTION I

OVERVIEW OF THE PROBLEM AND PRESENT PRACTICES

Background

Man's concern about his environment may be as general as worry about his death as a species because of atmospheric pollution or as specific as the frustration caused by a massive freeway traffic jam. While some are concerned about the hazards of nuclear reactors, others are concerned with the hazards of raising a large family in the one room kind of housing used by poverty stricken families in our big cities.

Within the last few years there has been a tremendous increase in concern with environmental matters. Clearly these concerns are perceived differently by individuals or groups from their special frames of reference. Preserving a stand of California Redwood trees is not the same thing to the Sierra Club as it is to the lumber company owning the trees. Locating a new expressway through the downtown area of a big city is a different problem to the highway engineer than it is to the families living in the low cost housing likely to be demolished for the highway. The immediate environmental concerns of an above average income family living in a newly developed suburban community are quite different than those of a family living on welfare in the central city.

Environmental education which focuses on problems of concern to urban populations is a matter of growing importance. Less than two generations ago 70 percent of America's population lived on farms or in small villages. Today 70 percent of the people live in metropolitan areas where we find some concentrations of people as high as 70,000 per square mile in basically residential areas. Without question many of the environmental concerns of pupils living and going to school in these congested areas is markedly different from the concerns of pupils attending suburban rural schools.

Clearly, of course, some environmental education concerns are broad or basic enough to be important to all pupils and schools in the country. All are interested in the basic necessities of food and shelter which are vital parts of our environment. Most, since they live in increasingly congested cities, are interested in transportation problems as they now exist and in considering alternatives to our presently deteriorating system. Many Americans are becoming aware of the possibility of serious electrical power shortages in the years immediately ahead.

Some environmental education concerns are international in scope. The air pollution produced in West Germany drifts over that country's borders and becomes a part of a single atmosphere used by all mankind. Water removed from the Colorado River in Arizona

influences farming in Mexico just as water removed from the Ganges in India influences Bangladesh. Spills from oil tankers can seriously damage marine life in large seas or the oceans. Pesticides being washed off of national lands end up in international waters killing organisms which produce oxygen necessary for all life on earth. Concern for problems of such magnitude must be shared by educators in all countries and it is not surprising that international agencies such as UNESCO and the Organization of American States are giving attention to such problems.

While we can expect that teachers in urban schools will help children develop an understanding of environmental problems which are worldwide, we can also expect these teachers and their students to be interested in and developing an understanding of problems involving their school neighborhood, community, state, and country. Increasing numbers of teachers are "tuning in" on the expressed concerns of pupils in their classrooms. These teachers are not limiting the subject matter to be taught to that found in a textbook or syllabus but include study of problems unique to a school, community, or other specific governmental units. Teachers and administrators are under pressure to become more "accountable" to the constituents they are paid to serve. Thus, we can expect schools to respond to the demand that schools become more concerned with environmental education which is important to their children and parents.

Certainly governmental leaders continue to believe that education is of great importance in improving the quality of life in this country. At the national level substantial funds have been made available to encourage the development of imaginative programs in environmental education. Support continues for programs designed to upgrade teachers in their abilities to plan and teach in this area. Governmental concern is also found at the State level as was shown by California which passed, in 1968, legislation requiring "that adopted courses of study must provide for instruction in protection and conservation of resources at appropriate grade levels and subject area grades 1-12 and that man's relation to his human and natural environment shall be part of the social sciences program."

America's problems for the remainder of the twentieth century appear to be concentrated in her big cities. Crime, poverty, inadequate housing, transportation, and pollution problems are painfully evident in all metropolitan areas. Since most Americans now live in such areas it is very clear that our success or failure in dealing with these problems as a nation will be determined primarily by what we do or do not do in our cities.

Urban schools should, immediately, examine their programs and practices with a view toward determining what they can do to involve their children more heavily and constructively in the extremely important task of improving concern for the quality of life in our cities.

Present Status of Urban Environmental Education

Most urban school children are not involved in meaningful environmental education programs. The programs of instruction at both elementary and high school levels are already overcrowded with traditional subject matter; parents are becoming more demanding of teachers and administrators; taxpayers are complaining vociferously about school costs; students are becoming more critical of their teachers and courses of study. Pressures such as these make it difficult to change the on-going program in a social institution such as a large urban school system. It is easy to continue to operate in a business-as-usual fashion with committees being formed to suggest changes in programs or new textbook adoptions but with very little change occurring "where the action is"—where teachers interact with learners.

Reading

Urban education is typically confined to what goes on within four classroom walls and controlled by the teacher in charge. And environmental education is no notable exception to this pattern. Thus we are likely to find students "reading" about air pollution, oil spills, mercury contamination in fish, poverty, slum housing, and other environmental matters. Some reading may be done from current materials such as weekly newsletters, newspapers, or standard magazines but reading from a textbook is still likely to predominate. Too often students will be tested on what they have read and they are expected to reproduce the author's conclusion on a controversial value-laden issue even though they might disagree with it.

Discussion

Many urban teachers have classroom "discussions" on environmental education matters. Unfortunately these discussions are often very narrow and limited; they tend to focus on the review of an assigned reading, or a speech, film, or TV program. The teacher may guide the discussion so that it "sticks to the facts" as they have been presented and discourage students from "arguing" about the fundamental questions being examined.

Discussions can provide a potential framework for students to debate the basic differences which exist among diverse elements of our society in regard to environmental matters. Who should bear the cost of reducing industrial pollution of air and water? Why? Who should pay for clearing up litter along streets and highways? To what extent are such questions to be answered by <u>individual action</u> or by <u>governmental action</u>? Examining questions such as these in classroom discussions permits students to reflect on their personal values which bear on environmental education issues of concern to everyone. And such questions, which are close to the daily living of urban children, permit them to enter into discussions on the basis of what they have observed and learned to value outside of school. Thus they need not necessarily defer to what the book says or what the teacher believes to be true. Discussions which are conducted in this open style can be useful in helping students build understandings about environmental issues.

Motion Pictures

Concern about environmental matters has resulted in the production of many motion pictures for a variety of reasons. Industrial companies develop films which show what they are doing to maintain or improve the environment or in some cases to explain why such efforts will increase production and subsequently selling costs. Conservation groups have developed films which show what they have done or what needs to be done to improve some aspect of our environment. Governmental agencies such as the National Park Service, The Forestry Service, Housing and Urban Development, and many others have produced filmed reports on what they are doing to maintain or improve the quality of living. Such films are being used by increasing numbers or urban teachers who typically have good logistical support from an audio-visual department in ordering such materials and in having them shown in classrooms.

This increasing use is a mixed blessing. Each film sponsor and producer has a clear purpose in mind. He is able to select and sequence his pictures and ideas so as to lead the viewer to a predetermined conclusion. But some of the conclusions are questionable —at least to people with other points of view. Should, for example, one agree with a chemical company film when it implies that pesticides have been an unquestionable boon to America? Should one question a film which implies that high-rise slum clearance projects have been very successful? Too often films are shown without adequate advance preparation or critical follow-up discussion. Under such conditions films which may have been made for propagandistic reasons may actually add to the confusing, conflicting messages already being sent toward school-age children. To counter this real possibility, careful efforts should be made to select films which might, for example, deal with the same general problem from different points of view. After such contradictory films a discussion pointed toward sorting out "truths" might prove useful to students trying to make sense out of their world. In any event, the present tendency of many teachers to use environmental education films without careful screening and student involvement in critical follow-up discussion should be changed to a policy of more intelligent usage.

Bulletin Boards—Displays—Concern for Room Appearance

Some teachers, particularly in elementary schools, involve children regularly in making effective bulletin board or showcase displays and frequently these deal with elements of the school, community, city, or larger environment. A plethora of pictures, newspaper stories, and headlines is available to the typical teacher and his class. Student-produced articles, graphs, illustrations, models, and pictures are often used. While some urban schools may have financial problems so severe that no art materials are available, it is safe to say that this is not the usual limiting factor in regard to effective use of bulletin boards. Teacher belief in the value of such displays and teacher willingness to give pupils time to prepare such displays are the critical factors. Teachers who believe and behave in this manner find it easy to get children personally involved in doing

something about the environment in their classrooms and schools and also in learning about environmental problems of city, state, or country.

Compared to elementary classrooms, junior and senior high school classrooms in urban schools are generally disgracefully inferior in terms of concern for attractive bulletin boards or other things which can make a classroom a pleasant environment in which to work. Special teachers in art, home economics, science and other areas emphasize the fact that high schools have the teacher "expertness" necessary. Teacher-pupil ratios are always more favorable in a secondary than in an elementary school. Older students at the high school level ought to be able to surpass elementary school children not only in academic or athletic accomplishments but also in "quality of living matters" as they might pertain to classrooms, school, or larger social units. The dullness, the drabness, the ugliness, the lack of concern for beauty in the typical urban high school classroom reflects directly the priority values of high school teachers and administrators. It is deemed more important to learn subject-matter facts than it is to learn how to produce and enjoy a pleasant environment. Resources are available, students are or can become interested —commitment by administration and teachers is missing.

Individualized Learning

Concern for more individualized learning is growing among American teachers generally. Some urban teachers are among those who not only try to honor individual differences in rates of learning but also honor individual preferences concerning subject matter to be studied in depth. We are not talking here of the honoring of preferences available through a wide program of electives at the senior high school level but rather of the honoring possible within almost any class. Many types of environmental questions-issues-problems might be studied as part of a general biology course. Similar possibilities exist in a study of American History in the junior high school. Comparable possibilities, at a lower level, exist in a unit study of Pioneer Life in America in an elementary classroom. In all of these classes many or most of the students will be eager to identify a problem of their own choosing which they will study in greater depth than is possible in the large class setting and then share their findings with class and/or teacher. Sometimes these studies will be strictly individual, at times they may be done more effectively by a small group. Out of such personalized studies students might develop a lifetime sensitivity toward and an awareness of some problems concerning the environment.

Summary

In this section we have given some attention to general ideas of how reading, discussion, films, bulletin boards, and individual studies are used and/or misused in urban classrooms concerned with environmental education. We have suggested some modifications which could be tried by teachers working alone or in groups. In some cases a resource specialist in environmental education would be very helpful.

It should be noted that every large city school system has some teachers who are doing an excellent job of environmental education in their present classroom work. They use readings focused on pressing problems, they skillfully guide discussions so that conflicting ideas get considered fairly with individual students being held responsible for reaching their own decisions. These teachers use films as important sources of value-laden data which must be subjected to analysis and debate. They use simple projects such as bulletin board displays or room beautification needs to get pupils involved in taking responsibility for their environment. They provide opportunities for individuals to get deeply involved in studies they define as important.

As some teachers work successfully in this manner they typify the kind of educator Dr. Wilson B. Clark, President of the Conservation Education Association, had in mind when he addressed the Govenor's Environmental Education Conference in Boise, Idaho, March 28, 1969:

> Some good environmental education programs are going on now. The real key to success in these efforts is <u>not</u> the money, <u>not</u> the beautifully published materials, <u>not</u> the fancy camp facilities, <u>not</u> the specially-built laboratory facilities. The key is the attitude of educational administrators and officials. (May I substitute teachers.) If they consider environmental education important, it can be (and in many cases has been) incorporated significantly into school curricula without major trouble or expense. The attitude is indeed the key.
>
> What is your attitude?

SECTION II

CHARACTERISTICS OF DESIRABLE PROGRAMS IN ENVIRONMENTAL EDUCATION

In the following section we identify and discuss briefly several desirable characteristics for good programs in environmental education. Can these be justified? From what sources have these characteristics evolved? To what extent are the characteristics acceptable to the many groups who are interested in environmental education in urban America?

Without citing specific educational philosophers, psychologists, sociologists, and curriculum specialists it can be stated firmly that hundreds of authorities have written millions of words supporting these principles which many of us regard as almost self-evident. Enormous support can also be found in parent and taxpayer groups for ideas which imply that education should result in (1) changed behavior, (2) greater insight into issues where social values conflict, and (3) a commitment to improve our quality of living.

Out of these historical generalized feelings regarding the characteristics of "good education" it has been possible for persons interested in environmental education to agree easily about the characterists deemed important in this field. The extent of this agreement was underlined in the reports of two widely separated environmental education workshops sponsored by the National Science Teachers Association in 1971.

One workshop developed desirable learning approaches for elementary schools as follows:

1. Interdisciplinary
2. Integrational
3. Relevance to the individual
4. Student involvement
5. Community and parent involvement
6. Focus on conflict of interests

At the same time another group working independently developed a statement which said learning approaches for junior-senior high school students should be:

1. Interdisciplinary
2. Learner centered
3. Problem oriented
4. Resulting in behavioral changes

Clearly the two lists have much in common. Experienced teachers, administrators, or curriculum developers can easily fit the ideas identified in one list into the other. It should be noted that the U.S. Office of Education in 1970 noted similar agreements and this is not surprising since, as indicated earlier, the learning approaches recommended are long-standing in American educational thought.

In the remainder of this section we will discuss briefly the rationale supporting our short list of desirable characteristics and we will attempt to illustrate some of their classroom applications.

Action Oriented

Students attending urban schools are eager to do something other than sit quietly in confining classrooms. This condition is associated, of course, with the basic physiologic need of all young organisms to use a developing neuro-muscular system. This need is even more pronounced in urban schools since the children attending there often do not have the same opportunities for vigorous play or work which are available to suburban or rural children. A few generations ago children had heavy physical work responsibilities at home and went to school to learn to read and to engage in other quiet learning activities. Today urban children spend many hours watching television, often in small apartment rooms. They attend movies and engage in other secondary type activities.

Often the environment which offers the greatest opportunity for physical activity for inner city children is the school. The popularity of athletic programs, playground activities, marching bands, industrial arts classes, home economics classes, and other learning experiences which provide students with opportunities to become actively contributing rather than passively receiving is well known. The enthusiasm shown by pupils as they plan or engage in activities both in and out of the classroom is understood by all who have taught. Factors such as these suggest that students are ready, in fact eager, to become involved in environmental education studies or projects if they will provide outlets for action.

What we are restating, of course, is the well known fact that students learn best through their own real life experiences. Ivan Illich stating in 1971—"If a person is to grow up, he needs first of all access to things, to places and to processes, to events, to records. He needs to see, to touch, to tinker into, to grasp whatever there is in a meaningful setting" is restating what John Dewey promoted about two generations ago. Children learn more readily by actively doing something rather than by just reading and talking about it. Specifically this suggests that environmental education will be more effective if "activities in a meaningful setting" precede and/or accompany reading and talking about environmental concerns. Thinking often develops more easily out of activity than preceding it.

While action oriented environmental education may start in the classroom or school, it is imperative that it move quickly into the neighborhood, community, or larger political units. The school environment is undoubtedly important to the school child, particularly in his early formative years. But even as a student he spends most of his time in the home and community environments where his school-based learnings may be supported or negated. The obvious fact that he will live most of his years not in school or classroom but in other community institutions or places also suggests that the school ought to be helping him understand the out-of-school forces that influence the quality of his living. While in school he might be helped to develop attitudes which focus his attention on community environmental problems but beyond that it would be ideal if he could develop, through practice, a commitment to work constructively to solve some of these problems.

This student "urge to action" is not entirely selfish. Many youth are disturbed about the deteriorating environment in which they will live out their lives. They see things they want to improve. With helpful support from teachers and administrators they can become enthusiastically involved in action projects designed to improve environmental quality around school, home, and community.

Concerned With Values

Environmental education programs should involve students in thinking about some of the value conflicts inherent in American society which bear on our quality of living. And on a more personal level children should be helped to think about their own behavior as it influences the quality of their living and that of others around them.

Kindergarten children are often helped to think about what they can do to keep their classroom "nice". They quickly accept the idea that individual action influences the group result. If the group wants to keep the room neat and clean, they as individuals are not free to behave in a contradictory fashion.

Typically elementary school teachers involve their classroom children in creating pleasant classrooms. Through art projects, keeping plants and/or animals in the room, and other projects such as attractive bulletin board displays, the children are led to value beauty and design in their classrooms. Typically junior high school and to an even greater extent senior high school teachers in the academic areas give very little attention to beauty in their classrooms and thus give students the impression that what was valued in elementary school is no longer important. The ugliness of much housing, older industrial plants, and billboards is evident to most school children who are more likely to have developed tastes in art and design which are better grounded in experience and instruction than were those of children attending schools in earlier times. Students can reflect on the value conflicts which sometimes exist between "economy" and "beauty".

What relationship exists between ever-increasing uses of electrical power and ravaging farm and forest lands by strip-mining? If we, as a people, must choose between more electricity or more air and water pollution what should be our choice? Why? Questions such as these provide opportunities for students to examine their own patterns of using resources and to become more aware of the impact of the enormous total social result of many individually determined actions. In a similar vein students living in urban areas can study the value conflicts associated with the American's proclivity to handle his transportation needs by privately-owned and operated automobiles. Does he and should he have a "right" to unlimited travel in urban areas when his use of this right results in excessive air pollution, fantastic waste of time, and other undesirable social costs? Who should decide what is right or wrong on such questions?

Problems associated with the use of electrical power and the use of automobiles are greatest in congested urban areas. Thus teachers can expect children to be willing to examine their value patterns and those of others in regard to problems of power and automobile usage. Out of such considerations should come, hopefully, greater individual and societal concern for environmental matters.

Environmental education must allow students to consider the options available in resolving the conflicts of interest inherent in many environmental problems and their solutions. Students must become aware of what must be given up to gain something else. They must become involved in and skillful at the difficult task of cost-benefit analysis as it relates to the various groups concerned with environmental matters.

Cooperative

Since much cooperative effort will be needed to improve man's urban environment, school programs should be planned to help students develop cooperative skills and attitudes. Evidence from studies made in inner-city schools suggests that many youth are becoming disenchanted with the intense individual competition which has characterized our schools and particularly the grading systems. Students have moved toward becoming more interested in being "best-liked" rather than being "best-student". Students respond enthusiastically in cooperative situations such as athletic teams, musical groups, and other voluntarily chosen special interest groups.

The qualities needed to become a contributing member of a cooperating group are not directly related to intelligence and/or ability to do academic work. A mediocre or poor student may possess unusual leadership abilities among his peers. Thus a teacher who plans for involvement of a class or group of students in cooperative ventures can often involve the natural leadership of the class in a very positive way; the class is caught up in working with the teacher in a mutually agreeable undertaking instead of working against the teacher as is too often the case.

Cooperative efforts, particularly in outdoor settings, provide students with opportunities for social interaction. Under adult guidance this interaction can result in the acquisition of desirable social behaviors. Cooperative efforts typically produce results which are larger, more dramatic, more satisfying than can be accomplished by any one person working alone.

Cooperative efforts in the field of environmental education can develop at many different levels in a school setting. One might find a single classroom group undertaking a beautification or clean-up project for its classroom or for the school generally. On the next level one might find an entire school working on an environmental problem which has been identified by administrator, curriculum leader, teachers, students, or better still, by cooperative effort of members of these groups.

On a higher level it is possible for an urban school or portion of a school to work cooperatively with a branch of city government such as a recreation department or division of city parks on a project related to environmental maintenance or improvement. Conceivably some schools could develop projects with maligned, but nevertheless important, city departments such as police and sanitation. Appropriate departments in a city should always be regarded as important sources of data regarding the city environment. These sources could, for example, provide comparative data on accidents, causes of death, per capita income, crime rates, and other vital statistics on a precinct basis thus permitting a comparison of "the many environments" found in a typical metropolitan area.

Schools or groups within schools may establish cooperative relationships with private groups such as Audubon societies, conservation clubs, or garden clubs. Such groups at times have planned projects which could be helped greatly by the type of work which school youth would enjoy doing.

Although the "cooperation" becomes somewhat more difficult to translate into immediately obvious results, it is possible to establish rewarding relationships with State governmental agencies (or their representatives), Federal agencies, elected representatives, or National organizations working on environmental concerns. It is quite possible, for example, that schools and school children in Florida may take some credit for helping to save part of the Everglades area from becoming the Greater Miami jetport.

Interdisciplinary

There is very strong agreement among specialists in environmental education that new courses added to the present elementary and high school programs are not what is needed. Rather it is believed that most subject matter courses presently being taught can be used to develop concepts about or attitudes toward environmental concerns if the teacher becomes aware of the possibilities and if the teacher takes seriously his responsibilities in this area.

Some situations are obviously more promising than others. The elementary school teacher who still typically is responsible for a group of 30 (more or less) pupils for most of a school day is clearly able to weave into his total daily program of instruction more attention to environmental education matters than is possible for a high school teacher who meets six different groups of students (180 more or less) each school day. Units of work or group studies as they are planned and conducted in many elementary schools often provide more "openness" for the teacher to shape the content to be studied than is present in a high school syllabus or textbook, particularly if the high school teacher is "running scared" in regard to Regent, College Board, or other external examinations.

But it is evident that environmental problems of greatest concern today are clearly interdisciplinary. Where should air pollution problems such as those associated with Consolidated Edison or other huge coal-fired generating plants be studied? In social studies since it clearly is a social problem? In science or technology classes since these disciplines are also involved? In health classes? In economics classes? In English classes since angry and cynical young people welcome the chance to write on such questions?

Where should urban transportation problems associated with the automobile be studied? In science classes because scientists and technologists are being asked to help solve some of the problems? In health classes because 55,000 deaths and more than a million injuries obviously identify a very serious health problem? In social studies classes because it is one of our largest social problems? In history classes because transportation, as well as most other things, can be studied in terms of historical developments?

In addition to the air pollution and transportation problems mentioned above, similar sets of questions could be asked about the use of pesticides, the wisdom of using super-tankers, offshore drilling for oil, urban planning, and a host of other environmental concerns.

Under the presently prevailing type of high school program of studies it is unlikely that problems such as those listed above will be studied in an interdisciplinary way in any single classroom. Science teachers are not able, generally, to look at a problem and see all of the ramifications apparent to a sociologist. The sociologist in turn may be unaware of scientific facts in a problem which are elementary to the science specialist. Problems such as differential death-rates due to socio-economic or racial factors may be perceived one way by a health teacher and another way by a mathematics teacher.

Thus it appears necessary that every teacher regard himself as a teacher concerned with environmental education. He, possibly with the help of specialists in environmental education, should locate and use materials which are pertinent to his subject field and useful in sensitizing students about environmental matters.

The examples which a teacher uses to illustrate principles or concepts may or may not be drawn from the contemporary world and its concern with environmental matters. The discussions which the teacher leads may get into or avoid such questions. Individual projects, assigned or optional, may go either way. As indicated earlier, elementary school classroom teachers are in a position to exercise even more leadership in deciding if their pupils may study appropriate environmental questions in a broad interdisciplinary way or in a much narrower fashion. It is possible, however, for both elementary and high school teachers to gear more of their teaching toward environmental concerns.

A team planning and teaching approach offers much promise for improving environmental education programs. As teachers representing different disciplines plan for activities and learning experiences appropriate for the study of a broad overarching concern, the result is apt to be integrated and interdisciplinary to a much greater degree than if teachers work alone. The John Adams High School in Portland, Oregon, for example, created a situation where mathematics, science, social studies, and language arts teachers planned a series of learning experiences geared toward group and individual study of "Our Environment— Its Use and Misuse." Such planning, particularly if it involves a four-period block of time as the John Adams program did, offers dramatic possibilities to improve environmental education.

Behaviorally Oriented

While understanding about problems in environmental education is prerequisite to action, the emphasis should be placed on changed behavior. Efforts of teachers and supporting administrative personnel should be directed toward helping children develop behavior patterns which contribute toward improving rather than demeaning their environment. Students should, as they move through the K-12 years of schooling, develop behavior patterns which will guide their living throughout adult years.

It appears desirable, for example, to have students develop behaviors which reflect a concern for wise use of resources. The simple habit of turning off electric lights when they are not needed in schools and homes has direct connections to wasted financial and mineral resources—and to air pollution. The habit of husbanding rather than wasting pure drinking water is another behavior which is becoming increasingly important in urban areas that all share the common problems and high costs of pure water sources and proper sewage disposal facilities.

Schools should help children develop the habit of personal involvement in assuming responsibility for environmental improvement. The kindergarten children working "to clean up the mess" made when a cup of water-based paint is spilled, the elementary school pupil taking care of flowering plants in his classroom, the junior high school students who take regular responsibility to clean up the school grounds, the senior high students who volunteer for "a work week-end" with the city park service, are all examples of behaviors designed to maintain

or improve the environment. Through many such experiences provided in grades K-12 a student can be helped to develop habits of personal responsibility for his environment.

Schools should also help children move from the attitudes too often found among adult voters of (1) "Let John do it" or (2) "Don't get mixed up in politics—it is dirty and crooked." Students should behave as if politicians are generally responsive to the people they represent. Submitting petitions, attending hearings, and writing letters about environmental matters are examples of responsible long-term behavior which can be started by school classrooms, groups, or individuals and then continued throughout a lifetime.

SECTION III

SOME NEW PROMISING DEVELOPMENTS

In this section we will consider two types of promising developments although the distinction between them is not as precise as we might like. The first type consists of things which are generally possible for teachers and/or local school administrators to accomplish within the present curriculum pattern of the school. The second type of development involves major revision of the curriculum and thus may be much more difficult to achieve in individual classrooms or schools since decisions of this type generally require clearance through central offices and approval by controlling boards of education.

More Integration of Environmental Education into Present Courses of Study

It is impossible to report confidently on the changes occurring in the classrooms of the tens of thousands of teachers who guide learning in our urban schools. However, our visits to many schools, judgments made by principals and supervisors, and the prominence of environmental education articles in professional journals representing several disciplines indicate clearly that growing numbers of teachers are giving attention to some aspects of environmental education. This increasing concern is inevitable if schools are responsive to the sharply increased general societal concern about the environment.

Students as they see, hear, read, and think about pollution, transportation, drugs, health, housing, and other such concerns acquire information or points of view which they bring to class discussions. Teachers as they acquire the same information (often from the same sources such as TV specials) are receptive to discussing some aspects of these concerns in their specialized subject matter classes even though the concerns are often broad and truly interdisciplinary. Special occasions such as "earth week" are providing increased opportunities for students to engage in activities or studies which cut across conventional subject matter lines.

This willingness of teachers to permit students to study questions which are often interdisciplinary and outside the teachers' major field should be encouraged since it is probably the quickest way to get many teachers involved in giving more attention to environmental education concerns. Encouragement along these lines by principals, special resource persons, or in-service efforts appears to be timely and highly promising.

Use of Selected Audio-Visual Materials

Powerful films and video taped documentaries which show the nature and extent of our urban environmental problems are available. Such materials can be used to depict conditions and to pose questions which must be answered if we are serious about improving the quality of our living. When the materials are used with proper pre-planning and follow-up they provide good opportunities to consider the highly emotionalized attitudes which the American people have developed on some environmental issues.

Examples of Films and Video Tapes

The televised series Man Against His Environment prepared by the State University of New York at Albany in 1969 is an excellent example of materials available in some urbanized areas. The 28 programs deal with content almost certain to provoke discussion even among apathetic high school students. The material includes suggested questions and "things to do to improve the situation". Some of the program titles which appear to be most promising for use in urban schools are "Too Many People," "The Squeeze on Earthly Space," "Agony of Cities," "Strangulation by Freeway," "The Slow Kill" (air pollution), "The Great American Thirst" and "Politics—Where the Showdown Is." It seems likely that most of the other 21 titles not cited above would prove to be equally interesting to high school students. For more information on this material, contact:

Judy Burke
Learning Resource Center
Empire University, 2 Union Avenue
Saratoga Springs, New York 12866

Many other agencies, groups, and commercial film producers have developed dramatic motion pictures which depict various aspects of "Man Against His Environment." ABC-TV has produced, for example, a film "Air Pollution: Take a Deep Deadly Breath" now available through McGraw-Hill. The National Film Board of Canada, Encyclopedia Britanica Films, The World Health Organization and many others have prepared similar materials—often of outstanding quality. Films such as the one cited immediately above tend to focus on environmental concerns which are often uniquely urban in character.

Films focusing on environmental matters such as wildlife, forests, water, and soil have been available for years from organizations such as The Department of Interior, The National Park Service, The Audubon Society, and The Sierra Club.

Any well trained librarian or audio-visual coordinator can easily build lists of promising film titles in many areas of environmental education. Selecting the films most appropriate for a particular school setting or population and also deciding where these films will be used in the school's total program are problems far more critical than getting promising titles. Few urban schools involve all faculty members who are concerned with environmental education in their classes in making these decisions. More should do so.

Filmstrips and Filmloops

Filmstrips which focus on Man and His Environment are becoming increasingly available from commercial sources. Singers SVE, for example, has developed a set of six filmstrips and three records entitled "America's Urban Crisis". Sub-sections of the set are (1) The Roots of Our Urban Problem, (2) The Air Pollution Menace, (3) Water Pollution—A Complex Problem, and (4) Solid Waste—A New Pollutant.

Filmloops with accompanying Teacher's guides and suggested lesson plans such as the Urban Ecology Series distributed by BFA Educational Media appear to be destined for much wider use. Titles such as "The City as a Human Habitat," "Garbage Dumps," and "Vacant Lots" are clearly painted toward urban problems of concern to many students and teachers.

Films, filmstrips, filmloops, slide-record materials, audio-tapes and other A-V materials can often provide a broad overview or introduction to environmental concerns in very interesting and colorful fashion. Some of the materials can often provide very specific information in a manner which is easily understood by students who have poor reading skills and consequently trouble with typical textbook or other reading materials. But such materials, as well as textbooks, are designed generally to involve students in action programs of learning more about their environment or doing something to improve it. Thus it appears that using such materials can serve a useful introductory purpose but teachers should not stop at that point. "Stage setting" is important but subsequent follow-up action is much more satisfying and necessary for students and for society.

Books

Authors and publishers are making available vastly increasing numbers of titles which are clearly concerned with environmental matters. Most of these books, booklets, or pamphlets are designed to give in-depth consideration to a specific problem rather than the more generalized treatment typically found in a textbook. Examples of such books are listed by Julian Messner, Division of Simon and Schuster, Inc., 1 West 39th Street, New York 10018 as follows:

1. How Will We Feed the Hungry Billions? (Food for Tomorrow's World)
2. How Will We Meet the Energy Crisis? (Power for Tomorrow's World)
3. How Will We Move All the People? (Transportation for Tomorrow's World)

Materials such as these are written for high school age youth who read at grade level. The titles are clearly dealing with matters of concern to many high school age youth. With teacher encouragement of

individual reading and possible reporting back to the class for follow-up discussion of controversial points, readings such as these might be quite useful in general science, biology, and social studies classes.

Superb source books which identify an enormous variety and amount of material pertinent to understanding urban life and problems have been prepared by the Boston Public Library. Clearly much care was given to the review of books, films, and filmstrips listed in the various sections. The potential users can get an excellent "feel" for each item listed and the recommended grade-level placements are very useful also. These sources were reviewed as follows:

What is a City?: A Multi-Media Guide on Urban Living and The Young People Reply, both of which are edited by Rose Moorachian, Boston Public Library, 1969. 152 pp. $2.00 payable with order.

Source: Trustees of the Boston Public Library
Attention: Miss Helen Sevagian
Information Office
Boston Public Library
P.O. Box 286
Boston, Massachusetts 02117

The first publication reviews books, 16 mm. films, filmstrips, loops, pamphlets, periodicals, recordings, and realia pertinent to city life and urban environment for pre-school children through high school students. Entries are organized into the following categories: What Is a City?: A City Is People—Famous People, Children, Teenagers, Gangs, Victims of the City, Families, New Comers; A City Is Many Problems, Many Solutions—Living in the Slums, Barriers, Crime, City Planning and Renewal; A City Is Transportation; A Place Where People Earn a Living; Education; Government and Services; Fun Places; Structures Above Ground and Under Ground; Nature; Music and Art; A Place with Personality; A Place Where Some Things Happen Which Cannot be Explained; and Cities of the Future.

For each entry the editor has provided information on the publisher, date of publication, length, and a one-paragraph review. For films, the addresses of publishers and distributors are included.

The Young People Reply surveys youth's opinions and attitudes of the topics discussed in What is a City?

Games, Kits

Within the past few years several environmental education problems have been incorporated into game-like situations which can be "played" by several students or by an entire class. Predominately these materials require that the players consider environmental or ecological matters as they attempt to solve the problems included in the design of the game.

Learning games are key features of Man and the Environment, the innovative life science course developed by the Educational Research Council of America and published by Houghton Mifflin, 53 W 43rd Street, New York, New York 10036. Descriptive literature suggests "Most groups will master the basic concepts of a game within one hour, and go on to make the creative changes allowed for in the rules. As a class activity, the teaching and learning potential of each game will continue for several days or weeks."

Two games included in Man and the Environment which appear to be geared to urban needs are described as follows:

"The Planet Management Game. Supplied with a 'cardboard computer' and basic data, players create their own roles as managers of an imaginary planet. Teams set up planetary budgets and chart the resulting economic and environmental changes. Decision-making depends on two players and their values. For two to twelve players, junior high school to college level, in biology, general science, history, and social studies classes."

"The Pollution Game. In this challenging game, players learn about the ecological crisis they are involved in, and use their bargaining skills to keep levels of pollution below lethal limits. The profit motive competes with other human values as citizens try to agree on proposals to improve environmental quality. A colorful game board, chance cards, ballots, playing pieces, and play money are supplied. For educational and recreational use, from junior high school to adult levels, with four to five players per game. Particularly suited to biology, life science, general science, and social studies classes."

Kits

Developers of instructional materials have sensed the mushrooming interest in environmental matters and have prepared instructional "modules," "packages" or "kits" that deal with specific areas of concern.

While such kits may serve a "getting started function" or may provide all the answers needed by teachers who feel very insecure in moving toward including more environmental education in their classes we believe they should be supplemented and ultimately replaced by locally prepared materials and by standard commonly available apparatus and chemicals.

A variation "kit" which offers considerable promise has been prepared by Berth Schultz and Phyllis Marcuccio and is available from Charles E. Merrill Publishing Company, 1300 Alum Creek Drive, Columbus, Ohio 43216. The material Investigations in Ecology consists of a boxed set of 6½" x 9" skillcards and costs $9.95. It is intended for upper-elementary and junior high school use.

"These investigations are set in both the man-dominated environment and natural habitats to illustrate the importance of interrelationships. Since real problems cannot be confined to any one academic discipline, the Skillcards span several disciplines: life and earth sciences, mathematics, and the social sciences. Subjects for investigation are available to every student in his own community."

"For flexibility of presentation, the investigations are grouped into three sections: People and Environment, Plants, Animals, and Environment, and Earth: Life's Environment. The format is ideal for nongraded and open classrooms or individualized learning situations in regular classrooms.

"Included is a Guide to Learning with suggestions for additional investigations, background information about ecology and environment, behavioral objectives, field trips, learning-site development, use of resources, and a bibliography."

Nasco, Fort Atkinson, Wisconsin 53538 distributes a study unit or kit designed for classroom or individual use entitled The Ecology of Polluted Water. This material prepared by Dr. Calvin Fremling, a professor of biology, Winona State College, includes a set of 86 color 35 mm. slides, a pre-recorded 40-minute cassette lecture, and a classroom set (25) of subject outlines with glossaries. The unit sells for $50. Descriptive materials and our examination of the unit indicate that it is "extremely broad in scope, the slides, lecture guide, and pre-recorded material combine to point out the dangers of polluting with heavy metals, insecticides, herbicides, detergents, acids, and other miscellaneous poisons. Then attention is turned to biochemical oxygen demand and bacteria that rob the water of dissolved oxygen, thus killing aquatic animals. Pollutants discussed include milk from creameries, blood from slaughter houses, garbage, excrement, and materials that utilize oxygen directly in oxidation reactions."

Specialized materials such as this unit might well receive serious consideration for inclusion in urban as well as rural high school science classes.

The Portland, Oregon public school system has developed its own "kits" of environmental education materials. The kits containing books, pamphlets, filmstrips, film loops, films, posters and other instructional materials are "loaned" to a teacher for use in his classroom for the time required for a particular unit of study.

Field Studies

Many urban teachers use field trips or preferably "field studies" as learning experiences which can be very useful in helping children understand their environment. Elementary school teachers who are generally not blocked into a time schedule as rigid as is found in most high schools typically make more use of field trips than do their high school counterparts. Elementary teachers tend to be more concerned with

the "total education" of the children assigned to them and are thus more likely to think of the total desirable impact of a field experience on their children. These teachers look favorably on experiences which can help integrate content from science, social studies, language arts, and other instructional areas. Elementary school teachers are also more likely to regard the social behavior problems associated with an out-of-school experience as an opportunity for boys and girls to learn necessary lessons about social expectations and desirable behavior. This position contrasts markedly from that taken by many high school teachers who often prefer to assume instructional responsibilities only for the specific subject matter content they are assigned to teach.

The environmental education program outlined by the Falmouth-Yarmouth, Maine school system in its K-6 curriculum guide provides a model readily usable in many urban schools. Grade levels focus on environments as follows:

K - 1	Our School
2 - 3	Our Neighborhood
4 - 5	Our Community
6	This Region

For each of these four environments it is suggested that the "natural environment themes" of land, water, air, plants, animals, and energy can be studied. In each environment attention can be given to "man-made environmental themes" of land and urban development, structural design, transportation, utilities, recreation, pollution and pest control.

Within a curriculum design such as this many urban teachers involve their classes in firsthand study of the environments of school and neighborhood. Older elementary children can extend their circle of contact into the community and, if transportation can be arranged, into the region.

In some large urban areas special facilities and specialized personnel are involved in organized field trip programs. The Department of Arboreta and Botanic Gardens, County of Los Angeles, conducts a school field trip program pointed toward "Outdoor and Conservation Education of Area School Children." Using four regular employees and 26 volunteers who are trained as field trip guides, the program has served more than 40,000 fifth and sixth grade children from 75 school districts. The field trip gives pupils an overview of the Arboretum and introduces them to content in (1) Plant science, (2) Nature and conservation, and (3) Early California history. Illustrated study guides are available for use in follow-up activities in these three areas after pupils return to their classrooms.

The New York City Board of Education has published a 76-page booklet entitled Science Trips—A Guide to Environmental Resources in New York City. This publication which was produced by the Environmental Resource Council of New York City provides detailed information for K-6

grade teachers who might wish to enrich a science study in their program by a less than one-day field trip to (1) The American Museum of Natural History, (2) Brooklyn Botanic Garden, (3) High Rock Park Conservation Center, (4) New York Aquarium, (5) New York Botanical Garden, (6) New York Zoological Park, (7) Prospect Park, or (8) Queens Botanical Garden. This type of teacher guide which is geared directly to courses of study and learning resources unique to one location could be prepared by any large city system. The New York City booklet can provide a useful model for adaptation to other settings.

In a more general sense it is appropriate to remind ourselves that field trips, even of very short duration, should never be taken without careful planning of what is to be accomplished on the excursion, how it is to be done, and who is to do what. Equally necessary is the classroom follow-up where teacher and children analyze the experience they have had in the field and draw generalizations from it. Readers who are interested in a full discussion on the value of educational field trips and in getting tips on how to plan and conduct such experiences are referred to sources such as the New York City Guide cited above or Edgar Dale's Audio-Visual Methods in Education.

Increasingly we are finding urban teachers and their classes getting out of their classrooms to study not only what is found at the zoo or in a museum but to study real on-going city life. What happens in city council meetings when zoning changes are proposed? What can be done to reduce noise? What can (should) the city do to assure better housing? What is being planned to reduce the traffic problem? Questions such as these can often be investigated by individual students or classes through field trips or interviews.

In planning for more field trips and longer field studies for urban children, the opportunities already available to students attending some suburban and rural schools should be noted. Literally tens of thousands of students from these school systems go to Washington D.C., New York City, Chicago, or other metropolitan centers every spring on extended field trips which provide an opportunity to get acquainted with a new environment. One can hope that comparable opportunities to get out of their environment and into another for a period of time might be made available to many more inner-city students in the years ahead.

In addition to field trips such as those cited above, some schools are fortunate in being able to use public or private "nature centers" in their instructional programs.

The famous 800 acre Bellingrath Gardens in Alabama, for example, are visited annually by thousands of visitors including many school students. Special tours and guides are available to help students understand the origin, purpose, and nature of that environment. The University of Alabama Aboretum is another facility where school groups are welcomed to study what it has to offer.

The Audubon Society has been active in promoting student study in natural settings such as Stark Wilderness Center near Wilmot, Ohio. This facility originated by the Audubon Society in Canton, Ohio, is used by more than 8,000 students yearly who are scheduled for free conducted nature-study field trips. The National Audubon Society has developed near the city of Dayton, Ohio, a facility called the Aull-Wood Audubon Farm. At this place the society is involved in "Environmental education using a working farm as an example." The staff of seven persons working primarily with 4th grade pupils from the city helps children understand some of the basic elements of a farm environment. Teacher guides for use in the classroom preceding and following the farm visit are available.

Some teachers and their pupils have access to outstanding nature centers such as the Arizona-Sonora Desert Museum. This facility which is used by more than 20,000 students per year and visited by 1/4 million people has been described by Ray Chapman Andrews as "Truly one of the foremost living museums in the world." The Museum, staffed by 37 persons, has developed a traveling exhibit called The Desert Ark which is available for school visits.

While facilities such as those described briefly above are outstanding learning resource centers, urban school children—for the most part—cannot use them. Financial costs, transportation problems, scheduling difficulties, and other factors make it impossible for any sizeable numbers of urban children to study environmental education matters in a rural or pristine setting. And, as mentioned earlier, it seems more sensible to focus on the environments where students and parents are spending most of their time—school, home, neighborhood, and community.

Advanced Level Courses

In most schools it is relatively easy to add an elective course in environmental science for high ability students. While this is a fine arrangement for the few students involved, it does very little to satisfy the need for more and better environmental education for the vast majority of students who are not interested in or able to take such courses.

For the highly interested and able students, however, more urban high schools might offer a one or two semester course in Environmental Science such as is available at Antioch Senior High School in Antioch, California. In this course students who have studied Biology, Chemistry, and Physics and have some awareness of ecological relationships attempt to use laboratory techniques to study problems related to water, air, and soil in the Antioch Community. For the first eight weeks of the one-semester course they work four days a week developing laboratory techniques necessary to study actual field conditions. One day per week is used to critique the week's work and/or for outside resource persons. The second half of the semester is used to field monitor some of the major community problems concerning air, soil, and water. With appropriate adjustments for community problems such a course might be useful in almost any high school.

The Carteret County Schools in North Carolina have developed two full-year high school courses in advanced biology which use heavily the salt marsh, sound, and sea beach areas available there. It is noteworthy also that the school system is developing, primarily through ESEA Title III funding, a series of three-week teaching units in marine science for grades 4-10.

Another high school offers an advanced biology elective entitled "A Study of the Marine Environment" to seniors who have completed one year of biology and one year of chemistry. The advanced nature of the course is indicated in the syllabus which contains sections on oceanography, marine biology, environmental biology, cytology, biochemistry, microbiology, and behavior. While high school students will clearly not be able to go deeply into these scientific areas of study, the ones who elect to take such a course are typically very able and can learn much more than is often required in regular high school courses. This is particularly true if the new course provides opportunities for field work and individualized study.

Resident Outdoor Education

Resident outdoor education (R.O.E.) as it relates to school-based environmental education programs for urban children is of little importance. While this conclusion does not deny the considerable and at times the enormous value of camping for the urban children who participate in such programs, we are all aware that participation is limited to a very small percentage of the children who attend large urban school systems. Problems of finance, staffing, and facilities appear unsurmountable at present when one dreams of a week or more of successful R.O.E. experience for every sixth grade pupil in New York, Chicago, or other large city school systems. A limited number of smaller school systems such as Battle Creek, Michigan, have operated highly successful year-around R.O.E. programs for many years although it should be noted that such programs often started with the impetus provided by a generous financial grant from a company or philanthropist.

R.O.E. can be a high point experience for many children. It can provide a powerful linkage between in-school and out-of-school learning. But for most urban children the camp setting is not the real world they will be living in most of their lives. It can be argued that priority might well be given to understanding and improving the environment where they live and will be living if one must choose between that or school camping. Hopefully we may sometime arrive at the position where many more students can do both. With the foregoing cautions in mind, attention can be given to a few types of R.O.E. programs.

For several years the Cleveland, Ohio public school system operated, with Title I funds, a R.O.E. program for inner-city sixth grade children. The children (about 200 at a time) and their classroom teachers spent five days and four nights in a rented privately-owned camp about 15 miles from the city where the program was conducted primarily by a small professional camp staff augmented by college student

and regular classroom teacher help. The aim of the program was as follows:

> Our purpose is not one of nature study. We are more concerned with group dynamics, interdependence of individuals, and the interaction of individuals and their environment. We desire our students to be nature minded and not nature wise.

Children, teachers, and staff who participated in the program agreed that the experience provided a wonderful "break" from the regular classroom routine. The purposes cited earlier were accomplished by most participants. But there was little evidence that concern for the environment in the camp setting transferred to concern for school of home environment when they returned to the city.

The small city school system at Mansfield, Ohio (54,000) provided daily transportation for student groups to use a "Rural Life Center" which was in reality a rented 4-H Camp previously used only during summer vacation time. Sixth grade pupils and their teachers spent four consecutive days, 8:45 A.M. - 3:15 P.M., at the Center with two staff members and three student teachers learning about rural life in that setting. Again there is no question that the experience was enjoyable to most pupils or that it gave them a chance for vivid first-hand experiences. But questions can be raised about "transfer" back to the city environment where they live.

In 1965 the Fresno, California school system piloted a variation of camping which merits attention. Sixth grade pupils, 100 of them divided into three groups, spent one week in a mountain camp, one week in a seashore setting, and one week studying their city of Fresno. Directors of this "Laboratory for Learning" reported:

> The project attempted systematically to use the environment of the three areas to improve science instruction, to lead students to view interrelated surroundings with greater understanding and appreciation, and to set the stage for continued personal participation in their environment and for preservation and improvement of their environment for a richer life. The common theme interwoven in all the activities was ecology —biological and sociological.

No research data are available to indicate how successful the program was and it is quite certain that the cost of such a program precludes it being used widely in urban school systems. But the idea of studying two "natural" and one "man-made" environments to determine common interrelationships appears fruitful. It provides an opportunity for urban children to learn that ecological principles applicable to natural environments are equally applicable to urban communities.

Study Man-Made Environment

The environment of greatest concern to most urban school children is not the natural environment found in a nature center or in a one-week summer camp but rather the man-made environment in which they live and move daily.

Greatest attention is being directed toward the possibilities inherent in studying this real-life urban environment within a conceptual framework such as that developed in the Philadelphia City School System. The school district with support from the American Institute of Architects, The Arnold Bruner Fund, and the H. Heinz Foundation has developed a workbook oriented toward principles important in architecture and art. This booklet, designed for use in upper elementary and junior high school, involves students and teachers in examining questions and ideas such as the following:

1. What is the man-made environment?
   (a) Every place built or shaped by man.
   (b) An environmental design.
   (c) Both indoor and outdoor spaces.

2. Why do we build our environment?
   (a) For shelter from the elements.
   (b) For privacy—a place for differentiated activities.

3. What determines the form of our environment?
   (a) The size of man.
   (b) What we need for life and comfort.
   (c) The activities we carry on.
   (d) The land on which we build.
   (e) The materials with which we build.
   (f) The methods we use to build.
   (g) How we get from place to place.
   (h) How we make some places more important.
   (i) How we make our environment interesting.

4. How do we change our man-made environment?
   (a) By moving from one place to another.
   (b) By changing, adding to, or demolishing.

Within a framework such as this students can become informed about and sensitive to the changes going on around them which improve or degrade the quality of urban living. Starting with what man has made it is easily possible to move into the changes (good and bad) which man has created in the natural environment. There is, for example, a direct and obvious connection between modern waste disposal practices and water pollution. A direct connection between how we get from place to place and air pollution. A connection between speed and noise.

Rather than deal with environmental education matters in general terms using materials or examples which are unknown through personal experience to most urban children, it is possible to start from their present base of knowledge and concern. The "Philadelphia Approach" which appears to be very promising is along this line.

Attention should also be given to small but highly promising developments such as the Parkway Program in Philadelphia. This educational approach, which operates a school program without a school building, involves its students in continuous interaction with selected aspects of the city environment. They become aware of educational, aesthetic, transportation, commercial, political and many other kinds of resources available for use. Students frequently engage in study or work programs which are useful not only to themselves but to other persons.

Students may, for example, earn high school credit by serving as a teacher aide in an elementary classroom. As they help with the science or art of mathematics or social studies programs in elementary classrooms they earn credits in these areas of study.

The Pennsylvania Horticultural Society provides for Parkway students a course entitled "Green in City." Obviously this considers an environmental concern of many city dwellers. Parkway students may enroll in "Art and History" which is taught in the Philadelphia Art Museum. Educational experiences such as these which use resources and institutions indigenous to the city environment provide a reality base to education sorely lacking in most high school programs.

The Benjamin Franklin High School in Philadelphia has a small group of students working in a Local Action Program aimed at improving the environment around the school. They provide a 24-hour a day telephone service to take complaints from residents who live in the neighborhood who are concerned with and report such things as abandoned automobiles, dangerous housing, uncollected trash, rats, and other conditions typically found in depressed areas. The school group then contacts the appropriate city department and, if necessary, follows up with persistent reminders until action is taken to remove or improve the condition.

Programs of this nature are possible in any school. Younger children are generally eager "to get out of school" and engage in physical types of activities such as neighborhood surveys, school ground improvement, or other community service. Older youth are equally eager to spend time, especially if they can substitute it for regular classroom time, on work projects aimed toward improving recreational facilities, settlement houses, or other community agencies. Activities of this type can provide many opportunities for learning about their environment and its relationship to history, politics, science, technology, and life generally. Beyond these learnings, however, activities of this type can help students build an attitude of personal responsibility for improving their environment.

Basic Curriculum Changes

In the foregoing pages we have discussed promising developments in environmental education which may be accomplished by teachers and/or local school administrators within the present curriculum pattern of the school. While many of these ideas are promising they are often difficult to implement because of restraints built into the program and administration of large urban schools—particularly high schools.

Blocking out half of the school day for general education needs which might include study and action on environmental education matters is a basic curriculum change being tested at the John Adams Senior High School in Portland, Oregon. Teams of teacher specialists in science, social studies, English, and mathematics involve groups of about 200 students in a variety of learning experiences and activities appropriate in studying such problem areas as "Our Environment—Its Use and Misuse." The teachers, assisted by interns and student teachers working with them are able to offer and supervise many experiences in science, social studies, English, and mathematics which draw on content from these disciplines as the problem area is studied. It is possible to plan for a variety of individual, small group, and large group activities. The half-day block of time encourages field studies in the neighborhood, community, or the city at large. The current and changing nature of topics of interest inherent in a broad problem area such as "Our Environment—Its Use and Misuse" solicits student input into deciding what to study and how to study it. Thus, students are more likely to view themselves as important participants in planning and conducting their own education. Considerable evidence is available to support the conclusion that schools which provide students groups with a block of general education time appear to be giving more attention to environmental education matters.

The Parkway High School Program in Philadelphia cited elsewhere in this report operates as a school which is predominately community based. Meritably students become more concerned with the out-of-school environment if this is where they must help find some of their own classrooms or other learning situations and instructors. Clearly the Parkway Program offers opportunities for environmental awareness and work which go far beyond those possible in a conventional urban high school program.

Work-Study programs are growing rapidly in many urban schools. The idea of a half day of school combined with a half day of practical work is now incorporated into many vocational programs. Educational theory suggests that the same type of arrangement might be equally useful to involve selected high school students in environmental education concerns. Students interested in horticulture and/or outdoor work in a city park system might, for example, divide their time between school related work and actual work for the division of city parks. Students interested in social work might profitably divide their time between school and working as aides in a variety of social agencies.

Should (could) "legitimate credit" be given for such work-study programs? How can we provide adequate supervision? What will be the effect of such developments on the basic traditional high school programs? Questions such as these are often raised by timid people who are unwilling to pay the price of developing the more significant type of education sought by many disillusioned youth and needed to attack our increasingly serious environmental problems. Common sense and the experience of exemplary school systems identified throughout this report assures us that questions listed above, and many others, <u>can</u> be answered satisfactorily. But the answers must be created cooperatively by parents, students, teachers, administrators, state department personnel—by <u>all</u> who have a simple desire to improve our educational programs. In many cases the result is likely to bear little resemblance to our present program.

SECTION IV

"BLOCKS" REQUIRING ATTENTION

School Administrators

Concern with environmental matters has reached the level where it can be assumed that school boards would support policies and programs which will improve the environmental education available to urban children. Financial restraints as they presently exist in most big city school systems are likely to mitigate against school boards committing large sums of money to fund new programs in environmental education. But it is hard to imagine school boards opposing internal changes in the instructional program which offer promise of educating our youth more effectively on environmental issues if this can be done without additional cost.

Similarly it is hard to imagine top level administrators of large urban school systems anything but eager to improve instruction in this area particularly if this improvement can occur without additional resources. It appears, therefore, that administrative blocks are more likely to be found at lower levels such as assistant superintendents for instruction, instructional department heads, or the administrative staffs of individual school buildings. Again, it is hard to imagine assistant superintendents or central office department heads opposed to the idea of improving environmental education for children in their school system. Inadequate leadership, sometimes related to inadequate funds, appears to be a more common problem.

Possibly the most serious block presented by central office personnel is that of trying to maintain centralized authority or control of the environmental education program to be made available in the wide-ranging variety of schools found in any large city. Resources, including limited instructional leadership, are often directed toward central office production of curriculum guides. These materials typically are compromises designed to be useful to the entire city system but actually are <u>not</u> useful in dealing with many of the unique environmental problems found in and around each school building. Rather than spending time on such efforts, central office resources might be invested more wisely in working with the instructional leadership of specific schools.

Principals or their designated instructional leaders are of utmost importance in improving environmental education. The encouragement and support which they are in a position to give or withhold can do much to decide the nature of the instructional program which goes on in their buildings. Principals, for example, have great power in deciding what should or should not be done to improve the appearance of classrooms and halls in a school. Principals do much to decide whether teachers keep children quietly occupied in classrooms or if it is permissible to study environmental problems as they might be found

elsewhere around the school, in the community, or in the city. Principals control at least small contingency funds which can be used to try a promising pilot project in environmental education. Principals have influence with central office leadership to secure permission and sometimes supplementary monies to be used for promising projects. Principals are in a position to secure acceptance and support from the parents of children attending his school for approaches or programs which will stress environmental education more heavily.

Finally, principals of a school are key leadership figures in trying to "loosen-up" the traditional high school time schedule which often dictates content to be taught and method to be used. Modular scheduling, which can provide some relief, is seldom introduced unless a principal is convinced it is a good idea. Daylong field trips require administrative help and support which a principal may give or withhold. No teacher is likely to be foolish enough to attempt a week-end or longer field trip with students unless the plan sounds O.K. to the principal. Environmental studies seldom lend themselves easily to the 42-45 minute blocks of time placed end-to-end in most high school schedules. Principals must be involved heavily in thinking through how this pattern can be changed to accommodate more desirable experiences both in and out of school.

Teachers

Environmental education in urban schools will improve only as a result of changing attitudes and behaviors of teachers who work in these schools. In an earlier section of this report the point was made that environmental education should not be taught as a separate course but rather should be integrated into existing subject matter courses. Environmental education is less specific subject matter than it is a concern about the quality of present and future living on earth together with a commitment to work as individuals or groups to maintain and improve this life. Concern with quality of living can be woven into much subject matter content when a teacher wants to do it. Since few teachers today demonstrate regularly this concern for environmental matters, it is evident that they presently value more highly what they have been doing which is generally emphasizing traditional content materials.

High school teachers who have majored in academic areas of study during their college years of study are not necessarily sensitive to how this subject matter can be used in environmental education. These teachers, especially if they are teaching able students in college preparatory curricula, may feel under great pressure "to cover the content"—to get students prepared to do well on College Board or Regent's examinations. Such teachers need suggestions, encouragement, and help from colleagues and supervisory personnel concerning ways in which they might use their subject matter courses as vehicles to help students learn more about their environment. Such teachers must be convinced by argument and example that spending more time on such matters will in-the-long-run be valuable to them as well as to their students. Teachers must be helped to discover that students and their parents are likely to respond positively to more teaching about the environment.

Understandings and attitudes such as these will not be developed fully in any undergraduate teacher education program. While beginnings might be made at that time, the full development of an attitude toward integrating environmental concerns into conventional subject matter courses must occur in the crucible of a regular teaching assignment in a specific school. This suggests that teachers should be involved in in-service projects which help them develop a stronger commitment toward environmental education. In-service efforts should give teachers opportunities to discuss the successes and failures they are having as they attempt to integrate more environmental education into their teaching. Planning time must be provided if the school hopes to involve teachers from several teaching fields in developing a truly integrated program or if the school wants to involve large numbers of students in major environmental education projects. This is particularly true if the project—or a large part of it—is field based and the away-from-school supervision must be provided by the teaching staff.

Teachers unions as they have negotiated contracts which specify exactly the working hours to be included in the basic assignment, overtime rates, time available for teachers meetings, and similar details may have made it difficult to develop new programs, particularly if these programs involve teacher time away from school or outside of the regular school day or week. It appears safe to assume, however, that school teachers are willing to be partners in developing projects and programs which will help their students become more knowledgeable about environmental matters and more involved in programs pointed toward community improvement. Teachers or their representatives must be involved at the earliest possible moment in planning these new programs which might change substantially the role of the teacher in the classroom and in the community. This early participation in program planning, which must include pertinent financial considerations, places upon teachers part of the responsibility for developing the best programs possible under present conditions. Conceivably in some urban settings the mutual concern for environmental improvement shared by school teachers, school administrators, parents, and students might provide the center for effective cooperative action in contrast to the too common situations where these groups are expending energy fighting each other.

Students

Urban students span the full spectrum of variety found in American life. They range from the brilliant highly motivated senior high school student who is assured of a scholarship at the university of his choosing to the dull unmotivated junior high school student who is counting the days remaining until he can legally drop-out of school although intellectually he dropped-out or "dropped-off" several years earlier. Urban students have tastes as diverse as those of their parents who range from Snob Hill to the poorest ghetto. Urban students differ greatly in their attitudes toward the grades given by teachers to judge the quality of work done by students in their classes. Some students go "all-out" to be on the honor roll, to earn the highest grades, to graduate first in their class. But increasing numbers of students are refusing to work hard

simply to earn good grades. They see little relationship between significant learning experiences as they value them and the value put upon their school work by teachers.

But grading and report cards are so omnipresent in the educational system that the vast majority of public school children strive to earn good or at least passing grades. Life tends to become a bit more unpleasant at school, and often at home, for a student who has nothing but F's on his report card.

This concern for doing at least "passing work" results in patterns of student behavior which are well-known to all teachers. Students ask such things as, "What do you want me to do?" "What is the right answer?" "Do I need to know this for the test?" This student (and often teacher) obsession with "right answers" particularly as they are woven into easy-to-grade objective type tests poses obvious problems to both students and teachers as they might spend more class time considering environmental questions where "right answers" are determined by individual value patterns. How will a change in attitude be reflected in the grades I can earn in science or social studies classes? Can I get school credit for work I might undertake on a community environmental improvement project? Questions such as these must be answered in a manner acceptable to students before we can expect some of them to give up their "security blankets" of grades.

Students are thoroughly indoctrinated at a very early stage in their education with the inordinate importance of textbooks. They read together the stories found in primers and other reading texts. They are assigned homework specifying certain pages of textual materials. They are instructed to "open your books and write out answers to the questions found on page 237." They are told by teachers that the correct answer to a question which they have asked could be found on a certain page of their textbook. Out of experiences such as these many students develop a point of view which overvalues textbooks as the only trustworthy and important source of information for their school-based work.

But environmental problems are often too complex to be answered with the degree of assurance and finality found in most elementary and high school textbooks. Alternative positions on these environmental matters are developed most forcefully and clearly, not be textbook writers who dare alienate no one, but by organized action groups who stand to gain or lose by certain actions. The case for strip mining is made by individuals or groups who have very different responsibilities to the groups they represent. Students who are conditioned to read "correct answers" out of textbooks will not be comfortable initially in situations where they are expected to read sharply differing positions on an issue and then sort out truths, half-truths, and conflicting values with the intent of developing their own personal answers. Students must be helped to see that their reliance on textbooks and their concern for right answers mitigates against wise study of environmental questions. And students cannot be expected to change in these matters unless teachers lead the way.

Students in most urban schools, particularly at high school levels, have not been involved as partners in educational planning with their teachers. Students, as they undertake to study environmental problems, may find it difficult to believe that their ideas about identifying such problems and planning to work on some of them in community settings will not only be sought but honored. Effective teacher-student planning, especially if it involves more than one teacher and his class, requires time and new skills that may need to be developed by students, teachers, and administrators.

Urban high school students, particularly in difficult inner-city communities are often distrustful of teachers and administrators. Some students make strident claims that teachers are trying to impose middleclass values where they are not wanted or needed. In these circumstances it is especially necessary that environmental education efforts which involve more than one teacher and his class be planned very carefully. The planning must include students who represent most, if not all, of the diverse student types. Programs planned by only the administration and its typically hand-picked student council are inevitably doomed to failure.

Parents—Community

Parents tend to judge a school to a considerable degree on the basis of their own personal experiences in school. Since environmental education concerns, particularly in urban schools are a recent development, many parents may have initial doubts about the wisdom of some of the changes which are occurring. Many parents, for example, still hold rather strongly to the belief that when a child is enrolled in a school he should be, with few exceptions, working in the classrooms of that school. The idea that he might be spending very significant amounts of time "running around" in the community collecting data or working on environmental improvement projects sounds a bit suspicious. "School was never like that when I went."

Parents have become convinced that education acquired in school can help their children earn more money in the world of work. This implies that a child should be going to school to get ready for college or to learn enough of a vocational skill to enable him to enter the job market successfully. Parents believe they pay taxes so that the schools can accomplish these goals—they are much less certain that the schools ought to be spending resources and time on environmental education or community improvement matters. In fact, many inner-city parents regard education as a way for their children to escape from that environment to better suburban living. Thus, their interests may be focused more naturally on how to run away from environmental problems than on how to try to solve them.

Out of their own experience many parents believe that "teachers should be tough." Teachers should "make the kids learn." These parents are also inclined to believe that teachers can be trusted to know what is best for their children to learn and do. While teachers may have

been able to fulfill these parental expectations in simpler times with a much more homogenous student population, it is clear that such expectations cannot be realized today. "Teacher toughness" can be matched by student toughness—particularly in inner-city high schools. Teacher wisdom concerning what children should study about family planning, expressway location, slum clearance projects, community recreation, and city planning is grossly inferior to what a typing teacher knows about training typists. Environmental matters are so much more complicated, so interlaced with highly emotionalized feelings that community resources and involvement are necessary if the issues are to be studied in the broad context which is necessary. Parents must be helped to see that no teacher (or no other single individual) is wise enough to speak for all of the parties in conflict on some environmental matters.

Some parents and some organizations such as the DAR and Chambers of Commerce are disturbed with a growing tendency in schools to give more attention to problems or failures in our society and concomitantly to give less homage to traditional folk heroes and institutions. Is it permissible for students and teachers to question the belief that bigger is better? To question the assumption that we are solving our transportation problem with super highways and private automobiles? To question the right of industrial companies to pollute air or water? To question the "right" of an individual to use his private property without regard for the needs of future generations? Questions such as these inevitably arise when students study environmental education issues. And the answers sometimes developed by students reflect badly on traditionally honored groups or individuals. Parents must be helped to understand that such criticism is inevitable and likely to grow as we become more involved in environmental education.

As a school undertakes to work on environmental matters of concern to the immediate community, questions will arise as to what projects will be undertaken and for whose benefit. Identifying a worthwhile project is relatively simple in rural setting where one school serves a homogenous community. But it is much more complicated in congested areas where, for example, expanded public recreation facilities might be damaging to movie houses, skating rinks, or other privately-owned businesses. It appears necessary that teachers and/or schools undertaking to work on community problems plan carefully to use existing community institutions who have common interests and who may already be working on projects of interest to the school. Churches and a wide variety of public and private social agencies are likely to be interested in some of the environmental issues which are also regarded as important by school age youth. Working cooperatively with interested community groups in joint efforts will not only increase the likelihood of truly significant results, but it will forestall most of the criticism likely to develop if the school attempts to move alone.

Environmental education projects to improve a community might be designed to involve a very substantial amount of physical work to be done by high school youth. Particularly in areas of high unemployment a question might be raised as to the propriety of using unpaid

student labor when family heads are unable to secure work. But it is hard to imagine serious opposition to involving students in working with other community agencies or units to improve some aspect of the environment if the work is significant to the students, school authorities, and adult community representatives after careful planning is done. Checking with labor union heads, city officials, and others who can speak with some authority on such matters should do much to reduce the likelihood of trouble.

Instructional Materials

It is quite possible that many urban administrators and teachers are unaware of the enormous outpouring of environmental education materials presently coming from publishers and from school systems. Federal funding of special curriculum development efforts during the past few years resulted in local school systems in the production of hundreds of teacher guides and other resource materials designed for use in specific cities or areas. All of these apparently were useful to the teachers involved in the preparation of the mimeographed or published documents and some examples identified in Section VI may be adaptable to other schools. At least they could provide ideas for consideration by schools interested in developing their own environmental education materials.

Commercial publishers, riding the groundswell of increasing concern with environmental matters, have produced books, pamphlets, films, filmloops, slides, and other materials in numbers far greater than needed to develop good environmental education programs. The problem, therefore, is not a lack of materials but rather a lack of awareness on the part of many educators concerning what is available and more importantly a lack of planning about how the materials might be organized or woven together to make a satisfying program.

Teachers tend to be more concerned with teaching reading, English, mathematics, science, geography, art, or some other disipline rather than teaching about environment. Consequently they have not thought much about how environmental concerns might be woven into their teaching traditional subject matter classes nor have they thought much about the contributions of their teaching field to interdisciplinary studies in environmental education.

Since adequate instructional materials are available, the problem appears to be primarily that of providing leadership and resource person help to make teachers aware of the materials and how they can be incorporated into the instructional program or used in other more specialized ways. Identifying, at the building level, a teacher who could be helped to develop this capability appears to be a simple and promising first step. Workshops, institutes, and other teacher education opportunities are available for this specific purpose. Short pre-school or during the school year programs involving a school building staff with strong resource persons who are

knowledgeable about environmental education materials and programs can also be helpful. Principals could, if they wished, find volunteers in the school district or employees of governmental or social agencies who would be quite willing to discuss with teachers instructional materials uniquely geared to local situations.

PART II

TEACHING ACTIVITIES

Selected and Developed by
Mary Lynne Bowman

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FOREWORD

The activities included in this publication were selected and developed to give teachers ideas and examples of ways to implement environmental education in urban classrooms. One of the primary objectives of this compilation is to demonstrate that there are now in existence a variety of materials that focus on urban environmental concerns. The activities are "action-oriented" and involve student participation throughout the school community. It is hoped that they represent a positive approach to urban dwelling through the inclusion of activities that point out advantages of urban dwelling as well as ways to improve the quality of life in urban communities.

K - 3

ACTIVITIES

PURPOSE: To observe the effects of pollution on plants.

LEVEL: K-3

SUBJECT: Science

CONCEPT: An organism is the product of its heredity and environment.

PROBLEM: Health considerations; water quality—harmful effects

REFERENCE: All Around You—An Environmental Study Guide. Bureau of Land Management, United States Department of The Interior, Washington, D.C. .

ACTIVITY: Have students dig several small plants from a nearby vacant lot. Replant these separately in small containers. After you are relatively sure the plants have survived the transplanting, sprinkle salt on one, 4-5 drops of detergent on another, 4-5 drops of household oil on another. Leave one as a control. Chart observations; draw or photograph changes.

Discuss that the ingredients added to the soil are all waste problems (salt from highways, detergent from laundry and oil from automobiles). How do wastes affect plants? If they effect plants, is it likely they can be dangerous to humans?

PURPOSE: To organize a Rat Patrol.

LEVEL: K-3

SUBJECT: Science
Health

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Health considerations; disease control—breeding ground control

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN. Title III ESEA.

ACTIVITY: In the inner city and even in the suburbs there is always the danger of rats. It is important to work on this problem through the home and community because it takes a combined effort to get rid of this pest.

Discuss the fact that there are rats in the city because when the city was built the shelter for the rat predators was destroyed. Such animals as fox, snake, owl and hawk disappeared from the area. This allowed the rat to multiply. The city rat is an imported rat coming to the country by way of ships. He adapted very well to the city.

Rats are bad because they can spread disease. They, like all animals, need food, water and shelter. One way to get rid of rats is to take away their food and shelter.

Organize a rat patrol with your class. Begin by surveying the community to see where there are spots rats could find food and shelter. Make sets of canisters (coffee and other cans with tops), covered with wallpaper or contact paper to be used in each student's home—to house food usually left in a bag, food that rats like.

Have each child survey their home for any holes, etc. Rat holes can be stopped up by nailing tin over them. The metal can be obtained from the cafeteria—tops from #10 cans.

In some areas houses are being torn down. The rats that used these older houses for shelter are seeking another place to live and will go to the nearest house. Some trouble has been noted where houses have garbage disposals. The garbage put down the disposal attracted rats through the sewer and they investigated. Since they could not come up through the sink they got into the house through the commode. The Health Department is trying to find something that can be put into the disposal with the garbage so it will not attract rats. The problem could happen to anyone.

The easiest way to take away food from rats is to put the garbage in cans with a lid. Problems, however, will often come up in regard to garbage cans. Some of the suggested activities to do with certain problems are as follows:

a. My can gets stolen—The Rat Patrol can stencil a person's name on the can. This will cut down somewhat on the stealing.

b. The lid to my can gets banged up and lost—Many neighborhood stores, at the suggestion of the Health Department, are stocking garbage can lids to be sold separately. If a store in your community does not do this, one should be approached about it.

c. Dogs knock my cans over—The children can show the residents of the neighborhood a simple wire (from coat hanger) holder that keeps the lid on.

d. The garbage collectors bang up my can—The reason for this seems to be that many people throw their garbage into the can without putting it into bags. It sticks to the bottom of the can and the collectors bang the can on the truck to break loose that garbage stuck on the bottom. If all garbage was put into paper bags, this would not be necessary.

e. Trash and old cars, etc. in vacant lots and alleys are good shelters for rats. The Health Department will collect junk. They will not pick up pieces along the sides of streets, in alleys or lots. This litter and junk could be collected into a pile by the children; use rakes or big plastic bags; then it can be collected by the trucks.

Note: The Health Department has a great deal of material that they will give the schools to eliminate rats.

PURPOSE: To learn what kinds of pollution affect people and why pollution is dangerous.

LEVEL: K-3

SUBJECT: Science
Health

CONCEPT: An organism is the product if its heredity and environment.

PROBLEM: Health considerations

REFERENCE: Our Environment: A Collection of Lessons. Council on the Environment of New York City, 51 Chambers Street, New York, New York 10007, 1973.

ACTIVITY: Exhibit to the class a diagram or transparency of a human figure. Ask class—what kinds of pollution affect this person?

List on the board all the kinds of pollution which the class mentions.

What parts of this person's body are affected by air pollution? (Draw arrows to various parts and list symptoms.)

a) Eyes—made red and irritated by air pollutants.

b) Lungs—particles become trapped and breathing is harder.

c) Throat—made raw from air pollutants.

d) Head—headaches and dizziness from air pollutants.

What part of our body can be hurt by noise pollution?

a) Ears—if noise is loud enough, serious damage to ears and loss of hearing can occur.

How does water pollution affect us?

a) Beaches are closed.

b) Rivers like East River and Harlem River cannot be used for swimming.

c) We can get sick from drinking polluted water.

The cost of pollution is usually passed on to the public. How does this affect us? (Costs us—our parents—money.)

PURPOSE: To demonstrate the complexity of nest building and consider possible consequences when a shortage of nesting materials exists.

LEVEL: K-3

SUBJECT: Science
Manipulative Skills

CONCEPT: In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: Eco-Community relationships; species control

REFERENCE: Jennifer Ely McGraw, Graduate Student, Environmental Education, The Ohio State University

ACTIVITY: Collect and display a variety of birds' nests. Discuss the types of materials the birds used to build the nests. Ask students if they think making a nest is difficult and challenge them to try building a nest. Take class outdoors to collect material. (An overgrown field or vacant lot would be appropriate.) Encourage students to collect a variety of materials. Upon return to classroom, pair students and instruct them to build their nests. (Water should be available for the making of mud.)

Thirty minutes later, compare results. Do the nests look like real bird nests? Are they better or worse? If you were a bird, would you want to live in your nest? Why or why not? Do birds have hands to build nests with? What do they use?

Have the children place the nests in low shrubs and trees. Return the following week to see if nests have remained in good condition. (Just for fun, place a hard-boiled egg in one nest beforehand.) Nests might be artificially tested by fanning and sprinkling with water.

Follow up the nest building activity with the following discussion:

What materials were used to make nests? What were most nests made of? Did anyone have trouble finding really nice twigs (mud, grass, etc.)? Did anyone have to use twigs that weren't as nice? Did anyone decide to change to another type of material? What would happen if everyone in the school tried to build nests in the same place? What if everyone wanted to use twigs? What would some people have to do? How many birds do you think could find enough materials to make nests in this area? Could a hundred birds find enough materials? What about a thousand birds? What could birds do if there weren't enough

materials? (Explore the full range of possibilities such as migration, stealing, fighting over materials, use of unusual materials, and inability to build nests.) What do you think birds would be most likely to do? What might happen if many birds couldn't build nests? (Consider possibilities such as no eggs laid, eggs laid in unsafe locations, such as the ground, and vulnerability of baby birds and eggs to predators, falling, wind, etc.) Would there be as many baby birds the following year?

PURPOSE: To grow garbage.

LEVEL: K-3

SUBJECT: Science

CONCEPT: In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: Eco-Community relationships; ecological considerations

REFERENCE: Cherie Lund and Chanelle Wolfe. Exploration with Garbage. Project ECO-logy. Highline Public Schools, Seattle, WA. Title III ESEA.

ACTIVITY: Children can collect from garbage seeds, scrapings and other fruit and vegetable waste. Attractive planters can be made by decorating empty cans, jars and plastic containers. Seeds should be sprouted in glass containers without dirt but with wet paper towels or a damp sponge so children can see the roots forming. The children can plant things in a well-drained soil mixture. They can experiment with the scrapings to see which, if any, will produce growth. Why did some not grow?

Grapefruit, orange, lemon or tangerine seeds should be planted. They should be in rich soil, kept damp and in good light, but out of direct rays of the sun. Be sure to place at least a half inch of small stones in the bottom of each planter and make drain holes to allow excess water to drain out.

The top of a carrot can be planted in moist sand with only the upper part exposed. This develops into an attractive fernlike plant. With any vegetables, transplanting to an outdoor garden in the spring will be fun and interesting. Pineapple tops can be planted by cutting off the top green leaves with about one inch of the solid fruit portion attached (this is usually the way they are in the garbage). Place the base part in water with the green top exposed. When roots develop, transplant to a pot with soil and cover with a plastic bag for three weeks (the bag will be in the garbage too). A small cactus like plant will develop, and in 6 to 12 months tiny pineapples should develop. Avocado seeds should be planted pointed end up, with the tip just above the soil. It will take a month or two before it sprouts.

Sweet potatoes, onions, beets, or garlic may be grown by sticking three or four toothpicks around the middle of the vegetable and suspending it in the mouth of a glass jar. Fill the jar with water until the bottom part of the vegetable is covered. Keep in a sunny place.

You may wish to transplant seeds later. Remember an empty egg carton or half-shells of eggs make good planters.

Depending on desired size, reseal the gable, cut off the top of one side of a carton. Punch holes in the bottom for drainage. A seed packet taped to the carton will tell you at a glance what the seedlings will be.

PURPOSE: To investigate the urban acoustical environment.

LEVEL: K-3

SUBJECT: Science
Social Studies

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Aesthetic considerations

ACTIVITY: Ask your students how many sounds they think they might hear on a 5- to 10-minute walk around the outside of your school building. Record this figure. Take a portable tape recorder and, with the class, walk around the building taping sounds. (You should remind children before departing that you want to tape sounds that are already outside and not sounds made by the class during the walk.)

Upon returning to the classroom, ask children how many sounds they thought they heard. Record this figure. Play the tape and count the sounds. Compare results. How many are man-made sounds? How many are "nature" sounds? Which sounds did they like best? Least? Why?

What would happen if we passed a law saying the sounds we didn't like had to stop? How would our daily lives change?

PURPOSE: To investigate the "animal pollution" problem.

LEVEL: K-3

SUBJECT: Science
Social Studies

CONCEPT: Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

PROBLEM: Health considerations; disease control

ACTIVITY: Tally the numbers and kinds of pets owned by students in your class. What special kinds of care are needed when you have an animal as a pet in an urban area? What kinds of problems can be created if the owner does not or cannot properly care for his pet? Are some species better suited to urban living than others? Should everyone be allowed to have any kind of animal they want in the city? Why? Why not? What about chickens, cows, snakes? Who should decide what kinds of animals city folk can keep in their homes and yards? How should this be enforced? Good resources include your local animal shelter, city ordinances, your police department, and humane societies.

PURPOSE: To compare and contrast a variety of common sounds.

LEVEL: K-3

SUBJECT: Science
Language Arts

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Aesthetic considerations; noise

REFERENCE: Meet Me In St. Louie, Louie, But Leave Your Car At Home. Missouri State Department of Education, Jefferson City, Missouri, 1973. Title III ESEA.

ACTIVITY: Discuss with students what kinds of sounds are pleasant and which are unpleasant to them. What makes them that way? In how many ways can sounds be different? What determines which sounds are noise?

Given the following chart, instruct students to add three typical examples for each level and find ways of defending their choices. If possible use a meter to measure decibels to check the students' choices. Discuss how loud sounds feel. Is it easier for you to relax in a loud place or a quiet place?

Description of Sound	Decibels	Typical Examples
Threshold of Hearing	0	quiet church, still night in the country, sound-proof room
very faint	10	
faint	20 30 40	public library, country road, rustle of paper, whisper
moderate	50 60	large ship, average office, quiet car, average house
loud	70 80	noisy office, typewriters, radio set full, average factory
very loud	90 100	subway, busy street, noisy factory, loud public address system
deafening	110	thunder, gunfire, pneumatic drill, steam whistle
Threshold of Pain	120	

PURPOSE: To learn how personal health is significantly linked with personal habits.

LEVEL: K-3

SUBJECT: Science
Language Arts

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Health considerations; disease control

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

ACTIVITY: Discuss the importance of using your own toothbrush, handkerchief, drinking glass, etc.

Have children illustrate proper clothing for different types of weather—relationship between being wet and "catching a cold."

Discuss the importance of immunization shots.

Have school nurse explain how germs enter the body through cuts in the skin; explain how to cleanse and why this is important.

Draw pictures depicting disease germs; write a story about a germ who delights in bad health habits that help him get around the community.

PURPOSE: To observe man-made and natural items in the urban environment.

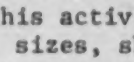
LEVEL: K-3

SUBJECT: Language Arts
Science

CONCEPT: Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies.

PROBLEM: Eco-Community relationships; natural resource use

ACTIVITY: Divide the class into teams and instruct them to go on a scavenger hunt in the school yard to find items which begin with the first letter of each of the letters in the alphabet. The first team to find the 26 needed items is the winner. (Teachers should set a time limit on the hunt before students begin.) Take the winning list and discuss which items are man-made? Which are natural? Trace each of the man-made items to its natural resource.

Variations of this activity include finding items of various colors, sizes, shapes (), etc. This can be a good activity to be used during walks to and from places.

PURPOSE: To develop communicative skills.

LEVEL: K-3

SUBJECT: Language Arts
Science

CONCEPT: An organism is the product of its heredity and environment.

PROBLEM: Eco-Community Relationships

REFERENCE: Jennifer Ely McGraw, Graduate Student in Environmental Education, The Ohio State University

ACTIVITY: Announce that you work for a television (or radio) station and would like to interview a bird. Explain that each child is now the bird that each has studied. Would anyone like to answer a few questions about being a bird?

(If there are no volunteers, choose a more self-confident or creative child.)

Questions can be phrased to contain considerable information so that the children will not be expected to know more than the most basic information about their birds. Such questions might begin with, "I hear that...," "Is it true that...," or "Do _____'s really..."

Children who are unprepared might also want to be interviewed. In this case, very general questions might be asked.

An interview might resemble the following:

"Hello, viewers, this is _____ of Station B.I.R.D. Today we are interviewing birds on the street. May I ask you a few questions, Ma'am?

"What type of bird are you?
Ah yes, I noticed the red head and thought you might be a red-headed woodpecker.
What do you like (dislike) about it?
Don't you ever get headaches from so much tree-pecking?
Why do you peck trees, anyway?
Tell me what is your favorite food?
What do you think of pizza? Strange, I didn't know woodpeckers liked pizza.
Would you mind telling me if you have a nest in this neighborhood?
How do you like this neighborhood?
Any trouble with cats?

"Well, I see that our time is almost up. Thank you for talking with us today. It has been a pleasure meeting you."

TURNING AWAY:

"Would another bird mind answering a few questions?"

General questions might include:

"Isn't laying eggs hard work?
"Do you ever get tired of sitting on eggs to keep them warm?
"What do you think of people?
"Do you ever people watch?
"How would you feel if a boy or girl took one of your eggs? Your nest? One of your babies?
"Do you like to eat worms? Sunflower seeds? Lollypops? Caterpillars? Onions? Breadcrumbs? Chewing gum?
"What do you do when it rains? Do you use an umbrella?
"What is your opinion of cats? Foxes? Hawks? Bluejays? Dogs? Owls? Squirrels?
"How do you like flying?
"What do you think of air pollution?
"Does smoke bother you?
"How do you like living in the country? City?
"What scares you?"

Questions for specific birds might include:

HOUSE WRENS...
"I notice that you build nests everywhere, even in boots, coat pockets and pants hanging on clotheslines. Why don't you just build your nests in trees?"

ENGLISH SPARROWS...
"Your nest often has gum wrappers, cellophane, kleenex, and other litter in it. Don't other birds make comments about this?
"Why do you always hang around in gangs?"

ROBINS...
"Why do you like to build nests on windowsills sometimes?
"Do worms ever fight back?
"Do people ever chase you away when you eat their cherries and grapes?
"Can you really hear worms under the ground?"

HUMMINGBIRDS...
"I notice that you use spider webs to hold your nest together. What happens if a spider doesn't want to give up her web?
"You have such a nice long, pointed beak for sucking nectar out of flowers. Do you ever check to see if there is a bee

in the flower before you put your beak in?
"What is your favorite color of flower?"

PIGEONS...
"Why do you like buildings and statues so much?
"Don't you ever want to visit the country?
"Do pigeons ever get stepped on or hit by cars?"

CARDINALS...
"I notice that you stay around all winter; don't your feet ever get cold?
"Have you ever wanted to take a Florida vacation during the winter?
"Ms. Cardinal, I hear that your mate is a very loyal mate and helps you take care of the eggs and little cardinals. What do you think of this?
"Mr. Cardinal, why do you always sit at the very top of a tree or telephone wire to sing?"

BLUEJAYS...
"I've heard that you have the nasty habit of eating eggs belonging to other birds. Doesn't this make you unpopular with the other birds?"

MOURNING DOVES...
"You and your mate are always together. Do you really like each other that much, or are you afraid to be alone?
"I notice that you only eat seeds. Don't you ever want a nice, fat, juicy worm once in awhile?"

MOCKINGBIRDS...
"Do the other birds mind when you copy their songs? Do they ever call you a copy-cat, I mean, copy-bird?
"Why do you do flips in the air sometimes when you are singing?"

PURPOSE: To use common things found in the environment to practice reading skills.

LEVEL: K-3

SUBJECT: Language Arts

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Aesthetic considerations

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN. Title III ESEA.

ACTIVITY: Here are some pictures of things you can see around your school yard. Below the pictures are some letters. Look around you. Sound out the words that name the pictures. Draw the picture under the right letter and sound.

A C T S L B N E W H

PURPOSE: To help students realize that litter is every person's responsibility.

LEVEL: K-3

SUBJECT: Language Arts

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Aesthetic considerations; litter

REFERENCE: Cherie Lund and Chanelle Wolfe. Exploration with Garbage. Project ECO-logy. Highline Public Schools, Seattle, WA. Title III ESEA.

ACTIVITY: Provide each student with 12 x 18 manila paper and crayons. Instruct students to fold paper in half, then in half again so that they have four parts to draw a story.

"This will be a story of a scrap of paper you found on the way to school. On this side (indicate left) start the story. Draw when you first see the paper. Then draw what happens next and next and next. The last picture will be on this side (indicate right). When you are finished bring it up to me so I can write about your story." As you talk with the children about their stories, praise them if they picked up the paper and disposed of it properly in their story.

PURPOSE: To write a cinquain.

LEVEL: K-3

SUBJECT: Language Arts
Fine Arts

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Aesthetic considerations

REFERENCE: Lib Roller. Using the School and Community. Environmental Education Dept., Nashville Metro Schools, Nashville, TN. Adapted from Mary: Charline McDonald, "A Place I Like," Washington Education, Washington Education Association, March, 1976.

ACTIVITY: What is your very favorite place in the world? _____

_____

Describe it using all of your senses. Try this method for a start:

YOUR FAVORITE PLACE

_____
(Use one word for color)

_____ _____
(Use two words for how the place feels)

_____ _____ _____
(Use three words for how it sounds)

_____ _____ _____ _____
(Use four words for how it smells)

_____
(Use one word for how it tastes)

Make up your own ways of describing your favorite place. Use words, sketches, anything you wish. See if some of your classmates can figure out what your favorite place is just by looking at your description of it.

PURPOSE: To develop the concept of uniqueness.

LEVEL: K-3

SUBJECT: Language Arts
Social Studies

CONCEPT: The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: Psychological and behavioral considerations; social aspects

ACTIVITY: Ask students to "help" you know who they are and how you can remember them by writing down or stating one thing about themselves that distinguishes them from everyone else in the class. (Discourage such factors as clothing, jewelry, etc., since these would not be a key to identifying an individual.)

After these have been shared, ask them to write down one thing about this class that makes it different from all other classes in the building. Next, one thing about their school that makes it different from any other school. Finally, one thing about their community that makes it different from any other community.

Does it get easier or harder to find something unique as you involve more people? Is the one thing about themselves still important when they describe their community? What kinds of things <u>are</u> important when we talk about large groups of people?

PURPOSE: To have pupils recognize their senses are not always affected by individual differences.

LEVEL: K-3

SUBJECT: Social Studies
Language Arts

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Genetic consideration; psychological and behavioral considerations

REFERENCE: William Hendricks, Growth: Suggested Activities to Motivate the Teaching of Elementary Health, Educational Services, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: Chart the color of each students' eyes. Hold up a beautiful picture large enough for all the class to see. Ask the pupils to describe it. Does eye color affect vision?

Fingerprint your students. Notice that each fingerprint is unique and not exactly like anyone elses. Have students close their eyes or blindfold them and let each student feel a familiar object such as a ball or pencil. Does the fact their fingers are different affect their sense of touch?

Have students note differences in their classmates' noses. Again, blindfold class and let each student smell something familiar to them with a strong aroma. Do different sizes and shaped noses smell things differently?

Does hair color affect senses? Height? Weight? Sex?

What kinds of things affect senses? (Cultural, attitudes.)

PURPOSE: To point out the importance of agriculture to urban living.

LEVEL: K-3

SUBJECT: Social Studies

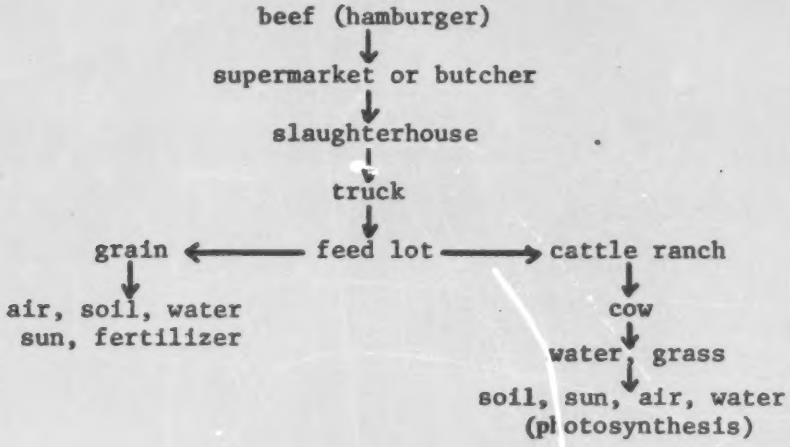
CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Health considerations; food quality

REFERENCE: All Around You - An Environmental Study Guide. Bureau of Land Management, U.S. Dept. of the Interior, Washington, D.C., 1973.

ACTIVITY: Discuss with students what categories can be used to group food in the supermarket. List the foods' origins—are they plant or animal? What different animals are used for different meats? How is food packaged? Is some packaging necessary? Are different plants used for food? From what part of the country do they come?

Have each student pick a favorite food and trace back the steps it takes to reach him.



How many steps has this food gone through? Do foods originate from within the city? How are farms important to city people? Should city people be concerned about how well farmers do their jobs?

PURPOSE: To observe change in everyday surroundings.

LEVEL: K-3

SUBJECT: Social Studies

CONCEPT: Organisms and environments are in constant change.

PROBLEM: Eco-Community relationships; effects of humans on ecosystem

REFERENCE: Rodger W. Bybee. "Earth Science with a Focus on the Child's Environment", Science and Children; 9(1); 11-14, Sept. 1971.

ACTIVITY: Take the students on a walk around the school, both indoors and outdoors. Focus their attention on change and ask:

- Is there something in the classroom today that is different than it was yesterday?
- Is there something that has not changed?
- What has changed since the school was constructed?
- What is the evidence of change?
- What objects interacted to produce change?

Observations of chipped paint, worn stairs, cracks in the walls, weathered brick, or broken windows could be pointed out.

- What changes were caused by people?
- By nature?
- What changes do the students believe to be good?
- Bad?

PURPOSE: To make a map using pictures that is accurate enough for someone else to follow.

LEVEL: K-3

SUBJECT: Social Studies
Fine Arts

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Eco-Community relationships; land use

REFERENCE: H. B. Lantz, Jr. Getting To Know Your Environments Through Maps and Mapping. Orange County ESEA Title III Project. Orange, Virginia 22960

ACTIVITY: Divide your class into two groups. Instruct each group to go on a different walk around their school grounds listing twenty or more things they see as they walk that would help someone else know where they have walked. (For example, if on the walk they go by a water fountain in the hall, they should make a note of that.) Remember to tell the groups not to tell anyone in the other group where they have walked because when they finish the activity they will exchange their product with the other group.

Note: Each group should determine where their walk will end and list only objects that other people will easily recognize.

Upon their return to the classroom, ask each group to draw pictures in order that will give other people clues to which way to go if they wished to walk to the same place.

Part of the map might look something like this:

When both groups have finished drawing their symbols, exchange "maps" to see if others can arrive at the desired destination.

PURPOSE: To develop an appreciation for the many people who help maintain community health.

LEVEL: K-3

SUBJECT: Social Studies
Fine Arts
Health Education

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Health considerations

REFERENCE: William Hendricks, Growth: Suggested Activities to Motivate the Teaching of Elementary Health, Educational Services, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: Begin by making a list, with the help of your class, of the people who work for the benefit of your community's health. List them on the chalkboard. You could begin the list as follows:

Doctors	Garbage Men
Dentists	Board of Health
Optometrists	Sewage Workers
Nurses	Surgeons

Divide your class into groups. Then have each group of students choose one of the categories listed, such as nurses, and make a poster showing the ways in which nurses contribute to community health.

Invite local "health workers" to visit the class to look at the posters and add suggestions of other services they perform in their work.

PURPOSE: To investigate ways to use garbage.

LEVEL: K-3

SUBJECT: Fine Arts

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Aesthetic considerations

REFERENCE: Cherie Lund and Chanelle Wolfe. Exploration with Garbage. Project ECO-logy. Highline Public Schools, Seattle, WA. Title III ESEA.

ACTIVITY: Ask students to bring from home yesterday's garbage.

Following is a list of some activities and art ideas that you can do with garbage. Your activities will depend upon what types of garbage you have. You and your class may think of different activities. Be sure to stress health and safety.

ACTIVITIES AND PROJECTS WITH GARBAGE

1. Put aside and clean and dry all bones. Try to reconstruct the animal using glue.

2. Mosaics and collages can be made from chips of egg shells, dried coffee grounds, or dried fruit peelings.

3. Egg cartons can be used for making caterpillars (remember to paint them a bright color!) trains, flowers, or anything else within the imagination of the group.

4. Using wasted paper towels from the lavatory or newspaper—one can paper mache. If light globes are in your garbage they make excellent maracas after being paper mached and broken.

5. If teacher wishes to explore the area of compost, garbage may be buried and dug up at a later date.

6. There are a variety of musical instruments that can be made from garbage:

   a. coffee can bongos
   b. can lid cymbals (make certain sharp edges are covered with tape)
   c. musical bottles (put different amounts of water into bottles—hit with mallet to produce different sounds).

7. Many exciting, creative things can be made from milk cartons of all sizes. (Before starting, wash and dry cartons thoroughly.)

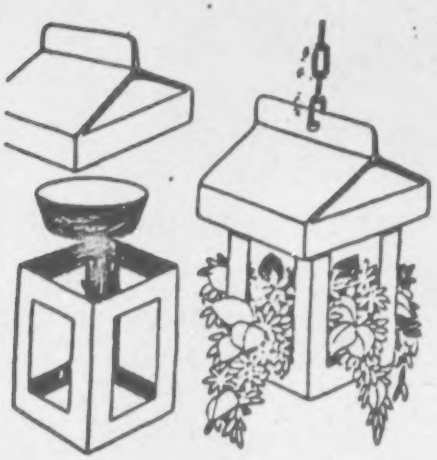
   Cut any size milk carton to desired height. Cover the outside with cloth scraps—felt, velveteen, printed cottons are easy to handle. Just overlap and glue. Self-adhesive papers work very well, come in attractive patterns and wipe clean.

   What will it be? A pencil holder, a button box, a litter box for the car? Maybe a cache pot for your favorite plant. Turn a carton upside down, cover it with matching wallpaper scraps, and it's a spray can cover for all those aerosols in the kitchen, bath and laundry.

   Make a box—a sewing box, a jewelry box, a box for recipes or photographs.

8. Hanging Planter

   Cut the top from a half-gallon carton. Cut each corner down 1" from the top and bend back. Cut openings in four sides. For the roof, cut the gable from a gallon carton 3/4" from the gable line. Fit the two pieces together snugly and glue. Use plastic cup for the plant container. Your planter is ready to hang or use as an attractive table decoration.



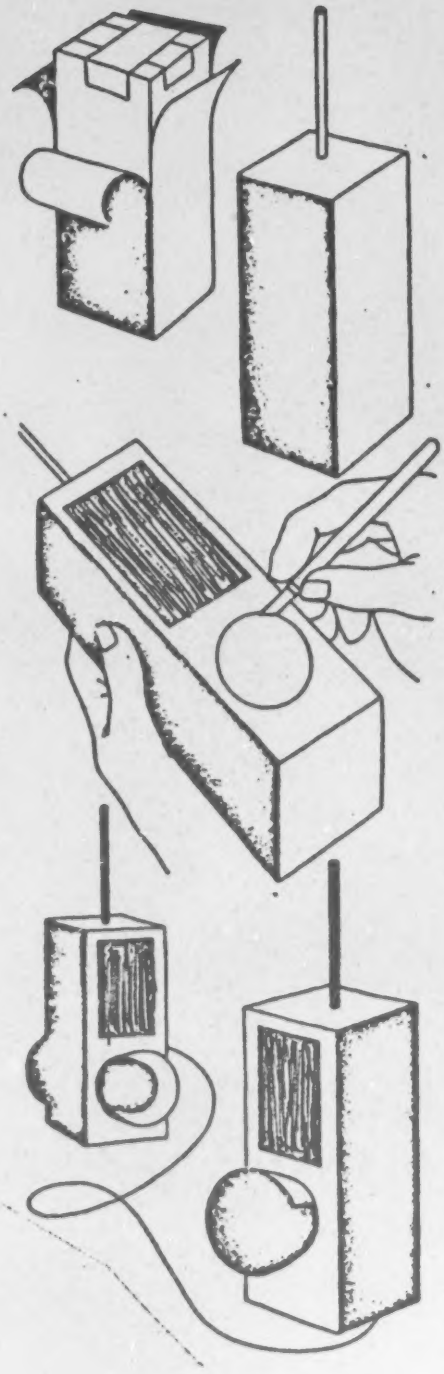
9. A Walkie-Talkie That Really Works

Cut the gables off two quart milk cartons. Cut two square pieces from a third carton to fit the opening and make a flat top for each carton. Seal on four sides with pressure-sensitive tape. Paint or cover with self-sticking paper.

Cut five slits 2½" long, 1/8" wide and ¼" apart. Start 1" from top of carton. This is where the sound comes out. Cut the bottoms out of two small drinking cups, leaving a ¼" edge. These are the mouthpieces. Cut two circles near the bottom of the carton just large enough to hold the cups, leaving about 3/4" of the cup outside the carton.

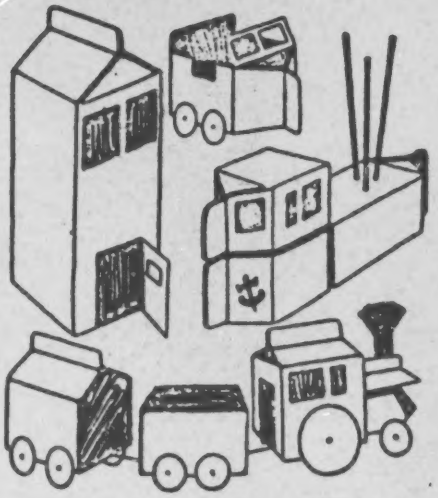
Tie a knot in one end of a long, long string. Punch a small hole in the back of one carton opposite the mouthpiece just big enough for the string to slide through. Pull the string from the inside to the outside until it reaches the knotted end. Punch the same size hole in the other carton and thread the string from the outside to the inside. Tie a knot in the second end; pull string backwards until it is stopped by the knot.

Insert one cup in each circular hole until it fits snugly. Insert a straw in the top of each carton for an antenna. The string should be slightly taut when sending and receiving.



10. Half-Pint Project

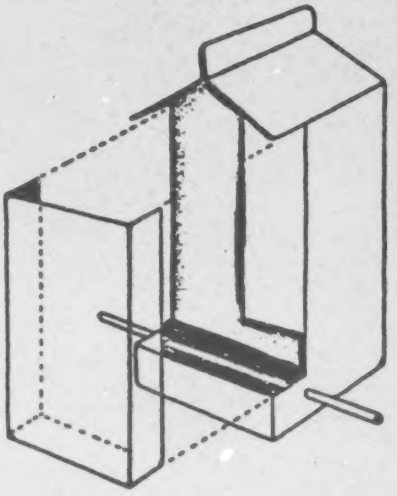
Build a village, boats, trucks or a train from half-pint, 10-oz., pint and quart cartons. Straws make good axles and derricks. Use spools, buttons or milk carton circles for wheels. Just cut openings for windows and doors. Spray with bright colored plastic paints. A cord, knotted at one end and strung through the cars of the train, will keep this pull toy "on the track".



11. Feed the Birds

Children will love to see birds come again and again to this easy-to-make feeder.

A half-gallon carton is a comfortable size. Cut opposite sides of the carton back 1½" from the top corners along the line of the table, then down from the top to 1½" from the bottom. Trim under the gable to make the roof overhang. Milk cartons don't leak, so punch holes in the bottom of the carton to let any rain water drain out. A plastic straw or dowel makes a good perch. Punch a hole in the top and hang from a branch or eave or nail directly to a tree or post. Fill the bottom with bird seed and watch the fun.



PURPOSE: To demonstrate that urban environments are built by man for man.

LEVEL: K-3

SUBJECT: Mathematics
Social Studies

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Aesthetic considerations; city planning and convenience

REFERENCE: Tobi Kipp Mills, Environmental Education Coordinator, New Lexington Schools, New Lexington, Ohio

ACTIVITY: Measure:

a. your height
b. your width
c. eye to the top of your head
d. hanging hand to ground
e. eye to ground
f. hips to head
g. waist to ground
h. waist to top of head
i. knee to ground
j. length of foot
k. span of hand
l. pace
m. learn how to measure something taller than you.

Compare these measurements to:

a. width of curb
b. width of street
c. height of parking meter
d. width of a door
e. height of a building
f. height at a window
g. height of a step
h. length of a door handle
i. measure 5 others of your choice.

Are the size of buildings good for the size of people? Why are some buildings so tall? How could you measure buildings taller than you? Are the buildings too large or too big for you? Where do you think something is too small—explain. What do you think is too large—explain. What would you change? (These questions may be written or discussed.)

PURPOSE: To discover the cumulative effect of litter.

LEVEL: K-3

SUBJECT: Mathematics
Social Studies

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Health considerations

ACTIVITY: Select one student to be the "Litterbug of the Week". This student is to throw one piece of paper per day on the floor and let the paper accumulate daily. Notice on the first day that just one piece of paper doesn't change the room environment to a great extent; but, by the end of the week, the five pieces look somewhat out of place. The next week, appoint all students as litterbugs. Each is to throw one piece of paper per day on the floor. (You should ask your custodian for cooperation during this period.)

Discuss what would happen if everyone in the school littered just one piece of paper per day. What if everyone in your town littered one item per day? Would we like our community if this were to occur?

You might expand this activity into a discussion of a closed environment and discontinue all custodial services in your room for one week. This can be particularly effective if students eat lunch or snacks in your room.

Discussion could include attracting a population of insects, mice, rats, etc. and ultimately endangering the health of the group.

PURPOSE: To increase the child's sense of belonging to a family unit.

LEVEL: K-3

SUBJECT: Fine Arts
Language Arts
Social Studies

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Psychological and behavioral considerations; social aspects

REFERENCE: William Hendricks, Growth: Suggested Activities to Motivate the Teaching of Elementary Health, Educational Services, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: Begin by discussing the question: Who is in your family? Are you the oldest, youngest, first, second, etc., child? List these questions on the board:

1. What makes a family?
2. What kinds of things does your family do together?
3. What do you do to help your family?
4. What do others in your family do to help you?

Make a family tree. Include the members who live in your house. Include other relatives like grandparents, uncles, aunts and cousins as well.

Have pupils draw a picture of something their family does together and write a story about it. Relate this to an art lesson and have children draw portraits of each family member.

Now ask students to write a thank you letter to each family member for an act of kindness shown to them.

PURPOSE: To help students examine their values toward their environment.

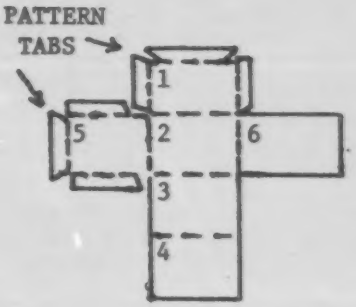
LEVEL: K-3

SUBJECT: Fine Arts
Language Arts
Social Studies

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Aesthetic considerations; psychological and behavioral considerations

ACTIVITY: Give each student a cube pattern. Instruct them to cut the cube from the pattern cutting on solid lines only. Fold along the dotted lines. Tape tabs to form a cube. Ask each student to think what he/she likes most about his/her city. Have class look through old newspapers and magazines to find that which he likes most about his city, cut out the illustration and paste it on cube side number one.



Repeat the process using the following questions to correspond to cube side numbers:

2. What do you like least about your city?

3. What does your city have a lot of?

4. What don't you find in your city?

5. What do you wish you had in your city that you do not now have?

6. What do you wish your neighborhood looked like?

Allow each child to share his/her cube with the rest of the class and compare likes and dislikes with classmates. How many dislikes can be changed? How?

PURPOSE: To study energy and to help children learn ways to conserve energy.

LEVEL: K-3

SUBJECT: Science
Social Studies
Language Arts

CONCEPT: The natural environment is irreplaceable.

PROBLEM: Eco-Community relationships; energy production.

REFERENCE: Marie Meaney. Home Sweet Earth, Project ECO-logy. Highline Public Schools, Seattle, WA. Title III ESEA.

ACTIVITY: Take the children to the playground to run races in order to demonstrate the energy within their own bodies.

After you return to the classroom, ask students the following questions:

What gave you energy to run your races?
What kind of energy is required to make cars and trucks run?
What kind of energy makes machinery work?
What kind of energy makes the appliances in your home work?

Take a walk around the neighborhood, looking for things that consume energy. Ask the children to remember what they saw and what kind of energy they thought was used, so that it can be written down on a chart when they return.

(The following words were given by a first grade class, as a definition of energy.)

electricity, gasoline, magnetism, muscles, brains, sun, fire, oil, coal, water, natural gas, wind

The children may cut pictures from magazines of those devices that consume energy within and out of the home. Paste the pictures on the energy charts.

Talk about ways to save energy. Write to the local electric utility company requesting the Snoopy chart on saving energy.

Select helpers each week to be in charge of saving energy in the room. Their job would be to make sure lights are turned off when the room is vacant or the sun is shining brightly. They can also pull the shades on cold days, keep the doors shut and check the thermostat.

PURPOSE: To start an aluminum recycling program.

LEVEL: K-3

SUBJECT: Science
Math
Social Studies
Fine Arts

CONCEPT: The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: Eco-Community relationships; land use, natural resource use, effects of humans on ecosystem.

REFERENCE: Council on the Environment of New York City, 51 Chambers Street, New York, New York 10007

ACTIVITY: Hold up several aluminum cans and ask the class—what should I do with these empty cans? Do they have to become garbage? Discuss that garbage has to be put somewhere and we are running out of places to dump it. Since each person produces about five pounds of garbage per day we could someday all have to live on garbage dumps. One way to help our environment is to reuse or recycle products rather than toss them away as useless aluminum is worth money (10¢ a pound) when it is recycled. Since there is only a limited supply of aluminum ore in the earth, collecting aluminum cans for recycling is one way students can share in helping the environment.

To start an aluminum recycling program:

1. Ask permission to start an aluminum recycling program from the school administrator.

2. Solicit the aid of the custodial staff to help find a place to store the aluminum.

3. Ask the Parent Association or other teachers if they would help run the program and help transport the aluminum to a recycling center. (Recycling centers can usually be located by checking the yellow pages and calling local aluminum companies. Other sources include local junk yards, dumps, citizen groups and city manager's office.)

4. Publicize the school recycling center with posters placed around the school and flyers sent to the parents.

5. Explain to students how to recognize an aluminum can as follows:

   a. Most are marked "all aluminum".

   b. They are lightweight.

   c. They have rounded bottoms.

   d. They have no side seams.

   e. A magnet will not stick to the side of the can.

6. Store aluminum cans, trays, and foil in large garbage bags. (If students crush the cans, with their feet, more cans can be kept in each bag.)

A - 6

ACTIVITIES

PURPOSE: To collect and examine airborne particles in several neighborhood sites.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: Health considerations; air quality

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN.

MATERIALS: A piece of cardboard approximately 12" square covered on one side with masking tape—sticky side up. A clear plastic film can be used to protect the sticky tape until you are ready to collect particles.

ACTIVITY: Place a tapeboard on an outside school window sill, facing the general direction of the wind and airborne particles.

Place a tapeboard on an inside school window sill.

Make tapeboards for the children to put inside their homes and bring back to school in a week.

Burn a newspaper or cardboard box outdoors when there is a slight breeze blowing. Place tapeboards about 4 to 6 feet upwind and downwind of the fire. Determine the difference in the amount of particulate matter collected on each. Observe smoke or its absence.

In each case, ask what they think will happen. Watch tapeboard each day for results. Where do the particles come from? What can be done to eliminate these particles? Why is there a difference by location?

The following is an extension of the preceding activity.

Select several local businesses such as a bakery, a gas station, a food store, and a machine shop. Prepare a letter of introduction to the proprietor asking permission to carry out this activity and explaining what it is that you are going to do.

In each business you have chosen to investigate, tape a collector paper onto a carefully selected wall. One paper should be placed at the floor level and the others should be placed at 2 or 3 foot intervals above each other to as high as you can safely reach. After one week, retrieve the

collector papers and label them carefully as to their location and height. Examine each one with a hand lens or microscope. Determine the number and types of particles in one square of each collector paper. Put this information in a chart similar to the one shown.

In which business did you find the largest variety of materials stuck to the collector paper? Which business had the greatest amount of particles on the collector papers? Which business had the greatest amount of air pollution? Were more solid particles collected on the highest placed paper than on the lowest? At which height did air pollution seem to be the worst?

Height Above Floor	Bakery	Food Store	Machine Shop	Gas Station
	No. Type	No. Type	No. Type	No. Type
8'				
6'				
4'				
2'				
Floor Level				
TOTALS				

PURPOSE: To examine soil erosion and its contribution to water pollution.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: In any environment, one component—like space, water, air, or food—may become a limiting factor.

PROBLEM: Eco-Community relationships; health considerations; water quality

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN.

MATERIALS: Two pie tins, tin can with perforated bottom, enough soil to fill two pie tins evenly, grass seed, and two containers to catch runoff water.

ACTIVITY: Sprinkle grass seed on one pie tin with the soil in it, press the seed into the soil, and moisten well. Place in sunlight and water twice daily. Let it grow for approximately two-three weeks.

Note: Step 1 is a separate project, which can be used with the following experiment. As an alternate to Step 1, a piece of sod about the size of the pie tin can be used instead.

Set pie tins (one with soil and grass and the other with soil alone) on a slant on the edge of a table with the catch basins on the floor under them. Sprinkle equal amounts of water on the two pie tins. Compare the amount of soil in each catch basin.

Put the water into an aquarium with fish. What happens? Will hamsters drink the water? Would the children drink the water? What can people do to prevent this runoff?

Conduct a field trip to locate some barren spots and to plant grass seed or other vegetation. Go back periodically to check the effectiveness of the seeding in controlling erosion. The project, when completed, may be newsworthy for the school or local newspaper.

The following activity may be used as an extension of the preceding experiment.

Take some lawn fertilizer or plant food. Put different amounts of fertilizer in jars of water. Add some water

plants and a few snails to each jar. Set them in a sunny window and watch what happens. Use a "control" jar without fertilizer. This will show how runoff of garden and farm fertilizer will cause algae to overgrow and use up all of the oxygen. This will take the oxygen from the fish and other animals.

PURPOSE: To use senses to evaluate water pollution.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: In any environment, one component—like space, water, air, or food—may become a limiting factor.

PROBLEM: Health considerations; water quality

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN, and The Dow Chemical Company, 1971.

ACTIVITY: Collect in glass jars one quart of:

a. City water fresh from the tap
b. City water after setting for twenty-four hours
c. Well water
d. Stream or ditch water*
e. Rain water collected in a container setting out in the open
f. Rain water off a roof*
g. Dilute vinegar
h. Dilute NaOH (caustic) solution (one pellet per quart)

Procedure

Before you start, show them how to taste the water by sipping from a paper cup and not swallowing it. Let them see, smell, feel and taste each sample, describe it. Make up a chart for them to fill in. See example below:

*DO NOT TASTE d, STREAM OR DITCH WATER, OR f, RAIN WATER OFF A ROOF.

Sample No.	a.		b.		c.		d.		e.		f.		g.	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Does it look good?														
Does it feel good?														
Does it smell good?														
Does it taste good?														

Which sample looks, smells, feels and tastes best? Which is best for drinking? Which is worst? Then explain what each sample was and how it can be improved by treatment. The vinegar (acid) feels "squeaky." Bases are slippery. If it isn't either, it is generally neutral.

PURPOSE: To investigate what type of toilet tissue breaks up and disappears best.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Health considerations; water quality

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN. Title III ESEA.

ACTIVITY: Obtain as many brands or varieties of toilet tissue as you can. In addition to the types made by various companies and sold in stores, your collection might include types often found in the washrooms of large commercial buildings. Instead of using toilet tissue, a variety of facial tissues or paper towels could be substituted.

Cut or tear two pieces from each type of toilet tissue. Every piece should be approximately the same size. Collect as many wide-mouthed glass jars (of the same size and type) with lids as the number of types of toilet tissue you have. Place a different type of toilet tissue in each jar. Tape one piece to the outside so that you know which type of paper is in the jar.

Put the lids on, and shake each jar back and forth in exactly the same way twenty times. Compare the paper inside the jar with the sample taped to the outside.

Allow the jars to rest undisturbed for one week, then shake them again in the same manner and make more comparisons. Why was the size of the jar, the size of the paper, the amount of water, and the number of shakes always kept the same? Which brand of toilet tissue had disappeared the most? Which brand had changed the most? Which brand had changed the least? Which brand would you consider to contribute most to pollution? Why? What does the term biodegradability mean?

PURPOSE: To investigate weather patterns' association to air quality.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Aesthetic considerations; air particulate matter—visibility, irritation

REFERENCE: All Around You—An Environmental Guide, Bureau of Land Management, United States Department of the Interior, 1973.

ACTIVITY: Keep a record of the days when the city's air is the poorest using weather information provided on news programs or in newspapers. Find out the weather patterns associated with good air and bad air; high or low pressure, humidity, wind velocity and direction. Is there any relation between weather and the condition of the air? Should smoke be allowed to be emitted any day without limits? Should daily weather patterns be consulted before allowing smoke emissions?

PURPOSE: To investigate biodegradability.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Eco-Community Relationships; effects of humans on ecosystem

REFERENCE: Our Environment: A Collection of Lessons. Council on the Environment of New York City, 51 Chambers Street, New York, New York 10007

*ACTIVITY: Display a piece of glass, aluminum, paper, apple, lettuce and steel. Ask the class to predict which of these substances are capable of rotting or decomposing; i.e., which are biodegradable? Conduct the following experiment to determine whether their predictions were correct:

Dig enough soil from a garden or vacant lot to fill five containers. (One-pound cottage cheese containers would be suitable.) Collect five pieces of each of the substances originally displayed and bury one piece of each substance in each container. Label each container 1-5. Examine one of the containers every week for the next five weeks. Each time a container's contents are examined, have class keep observations on the conditions of the five substances. After the last container has been opened, check the original predictions and draw conclusions about which substances are biodegradable.

*Note: Teacher should try this prior to using it in the classroom.

PURPOSE: Study the effects of air pollution.

LEVEL: 4-6

SUBJECT: Science

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Health considerations; air quality

REFERENCE: Charles E. Roth, Director of Education, and Miriam Dickey, Massachusetts Audubon Society, Lincoln, MA 01773.

ACTIVITY: Take your class on a walk around the school grounds to discover the effects of air pollution. Dirty buildings, damaged vegetation, poor visibility are obvious evidences.

Your students might be interested in getting a rough estimate of the *dust-fall* in the vicinity. This may be done quite simply: A large, clean bucket is filled a quarter full of water and placed in an exposed spot at least six inches above the ground. The solid particles that collect on the surface of the water after a day, a week, a month are a measure of the dustfall on a small area in given lengths of time. For a city like New York the monthly amount is more than fifty tons per square mile!

"Are there invisible particles, too, that pollute the air?" might be the question to start an inquiry into the various other air pollutants and the harm they do to property, to the beauty of a community, to the health of its people. The next question might be "What can be done about it?"

PURPOSE: To help pupils understand the importance of good lighting for good eye care.

LEVEL: 4-6

SUBJECT: Science
Health Education

CONCEPT: The rate of change in an environment may exceed the rate of organism adaptation.

PROBLEM: Health considerations

REFERENCE: William Hendricks. Growth: Suggested Activities to Motivate the Teaching of Elementary Health. Educational Service, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: With the room darkened from other sources of light, hold a 40-watt light bulb 60 centimeters (23 inches) above the reading material. This provides the right amount of light for good eye care. Move the bulb farther away and note how the amount of light on the page decreases. Now try the 100-watt bulb and note that if it is held 1 meter (39 inches) away it will provide the same amount of light on the reading material as would the 40-watt bulb when held closer. Discuss:

1. Why is adequate light needed for reading?
2. How does the eye adjust to differences in light intensity?

Demonstrate proper and improper reading positions to your class or have a student do it for you. Discuss what is good or bad about different positions in the classroom with lights on and off and with the curtains open and shut. Perhaps a research project on the amount of light reflected by the walls and ceiling when different colors are used could be encouraged to stimulate an outstanding student.

PURPOSE: To investigate noise produced by cars.

LEVEL: 4-6

SUBJECT: Language Arts
Science

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Aesthetic considerations; noise

REFERENCE: Meet Me In St. Louie, Louie, But Leave Your Car At Home, Missouri State Department of Education, Jefferson City, Missouri, 1973. Title III ESEA.

ACTIVITY: Have students secure the help of their parents or older brothers or sisters to compare their perception of noise inside a moving car and outside the car on a street corner.

While riding in a car for at least ten minutes, list the sounds you hear and explain their intensity. Now stand on a street corner for at least ten minutes and list sounds as you did when riding in the car. What conclusion can you make about noise felt inside the car compared to the noise felt outside the car? How might a busy street affect the people living nearby?

PURPOSE: To observe environmental problems around the school.

LEVEL: 4-6

SUBJECT: Social Studies

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Aesthetic considerations; visual pollution

REFERENCE: Our Environment: A Collection of Lessons, Council on the Environment of New York City, 51 Chambers Street, New York, New York 10007, 1973.

ACTIVITY: Inform your class that you are going on a walk in the neighborhood of the school to observe environmental problems around the school. Before leaving the room, ask the class to suggest problems they can expect to see. List these on the chalkboard. (Example: litter, graffiti, abandoned cars, noise pollution, black smoke from chimneys, exhaust from cars, etc.) During the walk have students record the environmental problems they see and where the problems occur. Upon returning to the classroom, compare the lists of observed problems to the list the class made before the walk. Make a map of your neighborhood indicating the problems your class observed. Discuss the cause(s) of each problem. Do we have to learn to live with these or are there ways to stop them? Ask each student to pick one problem that might be corrected and charge each with the task of correcting it in two weeks. At the end of the two weeks, repeat the walk and observations. Remove from the map all of the problems that have been corrected. This activity can be repeated throughout the year and can expand into talking with residents of the area, writing to city council, etc.

PURPOSE: To examine and observe student's surroundings.

LEVEL: 4-6

SUBJECT: Social Studies

CONCEPT: The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: Aesthetic considerations

REFERENCE: Man's Habitat—The City, An Environmental Investigation, National Wildlife Federation, 1412 16th Street, N.W., Washington, D.C. 20036, 1971.

ACTIVITY: Show the students a series of slides or pictures of the area around the school and around their neighborhood. Have them try to guess where the picture was taken, what details are included that they never noticed. Try to include pictures of the neighborhood as it looked many years ago—newspapers may have these on file. The students can guess where these old pictures were taken and where the photographer stood to take it. What year might the picture have been taken? What might it have been like to live then? Pictures might include different views of the school building, cracks, gutters, sewers, manhole covers, trees, railroad crossings, etc. If cheap photography equipment is available, the students may be assigned to take pictures of the things they see on the way to school. Have them point out the places they like best, the most dangerous places, the noisiest places, and so on.

A short walking tour may sharpen the students' observation skills. Have them prepared to answer questions like these: How are streets used? Is there any evidence to show that a street has been used to work on cars? What evidence is there to show that the street has been used for play? Is the street a source of noise? Does one side of the street have healthier plants? Does one side of each house look cleaner than another? Are there any puddles with a residue on them? What things happen at street corners? What are backyards used for? Are there any one-way streets? What determines how many lanes a street has? Have any roads been widened? How could a widened street affect homes and businesses in the area? Are residences located on alleys? If you could change some of the things you saw, what would you change? Would your changes result in any other types of change or side effects?

PURPOSE: To illustrate the "economics of modernization".

LEVEL: 4-6

SUBJECT: Social Studies

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Aesthetic considerations; cultural opportunity

REFERENCE: Charles E. Roth, Director of Education, and Miriam Dickey, Massachusetts Audubon Society, Lincoln, MA.

ACTIVITY: Visit an antique or junk shop and list the resources that went into various old-fashioned objects. Compare with the resources needed to create their modern counterparts. Estimate how many people were needed to produce the old-fashioned object and how many for the modern counterpart. Estimate costs of production. Estimate the "life" of both objects. Which object would cost more now? Why? Which object do you like better? Why? Should we try to produce objects the same way we did 200 years ago? Why?/Why not?

PURPOSE: To clarify values related to the individual student's neighborhood.

LEVEL: 4-6

SUBJECT: Social Studies

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Aesthetic considerations

REFERENCE: Gisha Berkowitz and Alan Levy (eds.). Housing in the Urban Environment. Group for Environmental Education, Inc., 1971.

ACTIVITY: Here are some ideas for student worksheets to help them identify their values. The students should have a better idea about their own neighborhood—why do they like it?

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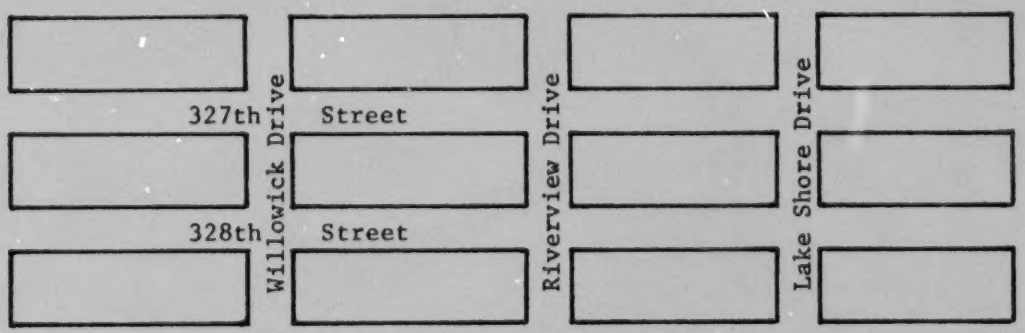
1. Would you rather live near a: ____Park ____School ____Candy Store

2. Put yourself somewhere on this line by putting an X between Larry and Cecil.

   Loner Larry_____Center City Cecil
   (likes it in the country) (likes it where the action is)

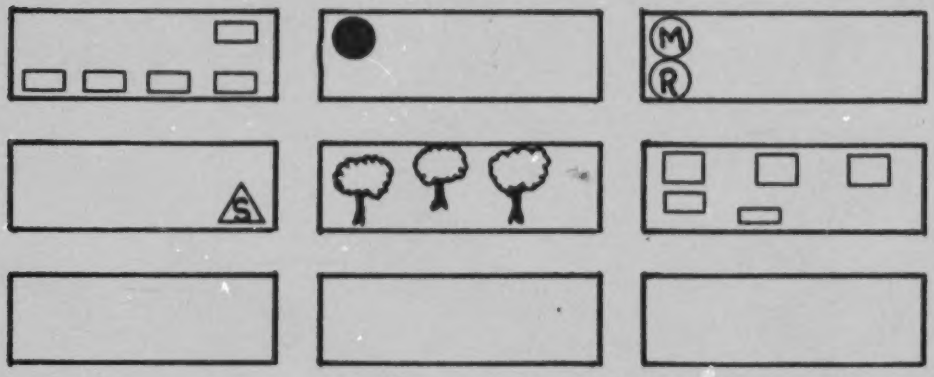
3. This is a picture of an area in your city. You are to build as many buildings in this area as you like. Use these symbols to stand for different types of buildings (you do not have to use every symbol):

your house	movie	police station
supermarket	factory	church
grocery	apartment house	park
candy store	school	house
restaurant	fire station	playground

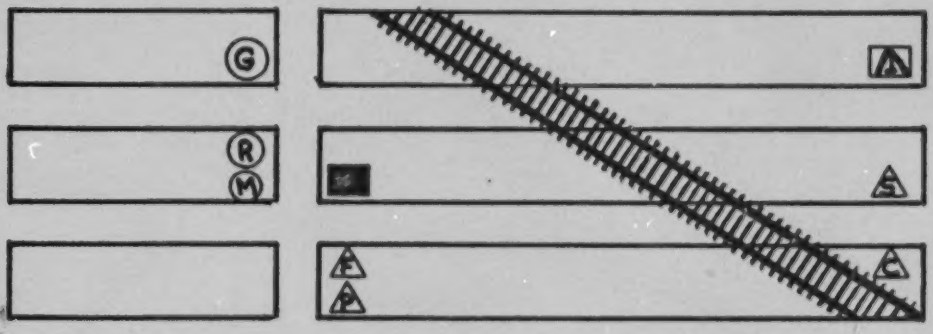


Pick three buildings close to your house and explain why you put them there. Pick three buildings that you either did not use or put far away. Explain why you did this.

4. In the area shown here, decide if you would clear the park for a supermarket. Explain why.



5. In the area shown below, what one thing would you move far from your house? Why? What one thing would you move closer to your house? Why?



6. In this arrangement, which house would you most like to live in? Which house would you least like to live in? Why?

PURPOSE: To compare urban and rural medical factors.

LEVEL: 4-6

SUBJECT: Social Studies

CONCEPT: An organism is the product of its heredity and environment.

PROBLEM: Health considerations

ACTIVITY: Collect the emergency and fire runs listed in the daily newspaper for one week. From the information provided in each listing, try to determine whether the cause was related to urban living. How many were illnesses? How many auto accidents? How many home accidents? How many would be likely to occur if these people lived in a rural area? Are these people who have been involved in an emergency situation better off to live in the city? What happens to farmers who have fires, illnesses and/or accidents?

Have students check with local insurance companies to determine if fire and accident rates vary for rural residents and city residents. What kinds of statistics do insurance companies work from to determine rates. Do these statistics and/or insurance rates correlate with the determinations your students made from the newspaper information?

PURPOSE: To make pupils aware of the factors that contribute to a healthy environment.

LEVEL: 4-6

SUBJECT: Social Studies
Health Education

CONCEPT: An organism is the product of its heredity and environment.

PROBLEM: Health considerations

REFERENCE: William Hendricks. Growth: Suggested Activities to Motivate the Teaching of Elementary Health. Educational Service, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: Begin your lesson by discussing these questions:

1. What things are needed for a healthy environment?
2. What things can make living conditions unhealthy?

Use the chalkboard and divide into two sides as follows:

HELPS TO HEALTH	HINDERANCES TO HEALTH
Proper room temperature	Too cold or too hot
Fresh air/proper ventilation	Stale air/drafts
Well-lighted stairs/handrails	Poorly lighted stairs/no handrails
Clean rest rooms	Dirty rest rooms

After formulating a list with the help of your class including as many factors that deal with health and safety as are appropriate to the teaching situation, have a committee draw up an evaluation card. Use a plus (+) for excellent, a check (✓) for average and a minus sign (-) for unsatisfactory. Then have the committee evaluate your school.

Discuss how pupils can help make their school environment a safer and more healthful place to live.

Have a committee "chart" the room temperature throughout the school day by reading and recording the temperature each hour.

When dealing with a community study unit in social studies, discuss the school laws that relate to health and safety of the state and health department.

PURPOSE: To prepare pupils to act responsibly in an emergency situation.

LEVEL: 4-6

SUBJECT: Social Studies
Health Education
Home Economics

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Health considerations; medical treatment

REFERENCE: William Hendricks. Growth: Suggested Activities to Motivate the Teaching of Elementary Health. Educational Service, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: Discuss the emotions of people in an emergency:

1. How should a person react? (With thoughtful calmness and promptness.)

2. What kinds of mistakes do people often make in emergencies? (Forget to give location of a fire, crowd emergency exits, etc.)

To help pupils act responsibly in emergencies, have the class decide what a person should do if:

1. He and a companion are lost in the woods.

2. He smells smoke in his bedroom.

3. He is babysitting and the baby chokes on a large piece of candy.

Have each child make a list of the emergency phone numbers he may need so he can mount them near his home telephone. Include the telephone numbers of the doctor, police department, fire department and the place of business of his parents.

Use a "play phone" system to practice reporting a fire in the proper manner.

PURPOSE: To help students interpret environmental implications of maps.

LEVEL: 4-6

SUBJECT: Social Studies

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Eco-Community relationships; land use

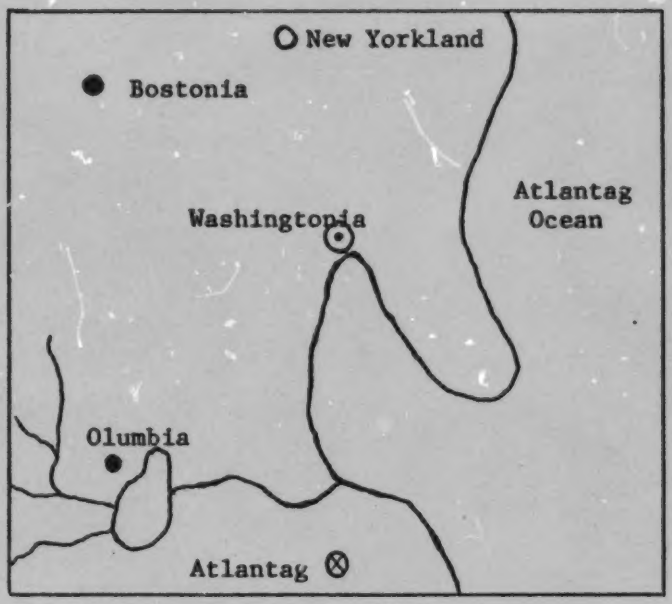
REFERENCE: H. B. Lantz, Jr. Getting to Know Your Environment Through Maps and Mapping, Orange County ESEA, Title III Project, Orange, Virginia 22960.

ACTIVITY: In this activity, an effort is exerted in the direction of encouraging students to extrapolate and interpret data from maps that may be termed "environmental"; i.e., maps that are a direct reflection of an environmental situation or environmental factor.

Instruct your students to use the included population and land use maps to answer the following questions:

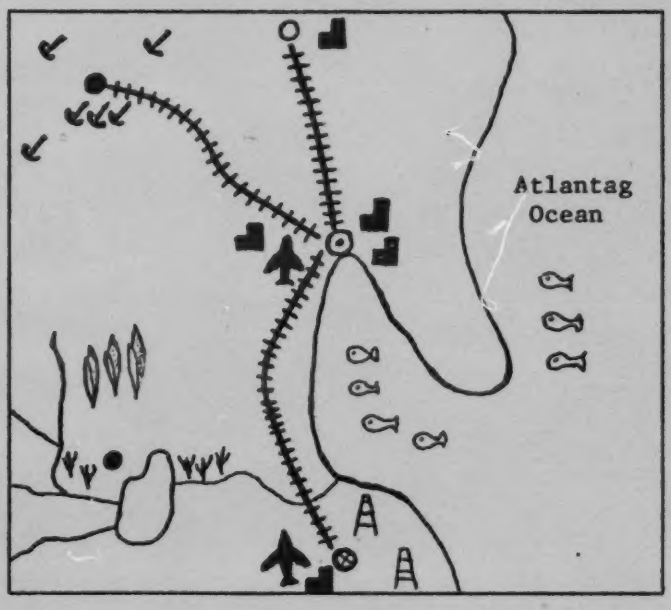
1. What type of jobs would the people living in Bostonia do? _____ Atlantag? _____ Washingtonia? _____
2. Which city would probably be characterized by condominiums and high-rise buildings? _____
3. Give two reasons why rice is grown near Olumbia and not near New Yorkland. _____
4. For what reason(s) would the largest city be located near the Atlantag Ocean? _____
5. In the event of severe drought which city would be the most affected? _____
6. Which city has to import the majority of all its resources? _____

POPULATION MA



- Cities under 5,000
- Cities from 5,000-20,000
- Cities from 20,000-50,000
- Cities over 50,000

LAND USE MAP



- Factories
- Mining
- Fishing
- Railroad
- Oil
- Rice
- Airport
- Corn

PURPOSE: To experience and discuss the effects of crowding.

LEVEL: 4-6

SUBJECT: Social Studies

CONCEPT: Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

PROBLEM: Psychological and behavioral considerations; crowding

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN. Title III ESEA.

ACTIVITY: Our human population is growing because more people are born than die each year. People are also living longer than ever before. Even today people are starving to death every day. Even in rich countries there are many people who do not get enough of the right kind of food to eat. Water is becoming in short supply. In many places it is already rationed. In our own country in the summer in some cities people can only water their lawn at certain times. As you are reading this, two people are being born every second.

On Earth there are two types of countries. The population of rich countries grows more slowly than that of poor countries. New medical discoveries were first applied in the rich countries and this helped the population to grow faster. In Europe and the U.S. women are having fewer babies. This holds the population down and allows more goods and services for the population.

In poorer countries the population is growing so fast that the countries cannot provide food, houses, jobs or schools. They must spend so much to make sure the people have food that they cannot buy new machines to help the farmers grow more crops. Most of the farmers are still plowing by hand and gathering the crops by hand. There is not enough food to go around and many people are too hungry to be able to work well. This, too, cuts down on the food supply.

The following are some activities to use with your class to demonstrate the effects of crowding:

a. Move about half the chairs and books out of the classroom. Use only part of the room. Conduct several classes. Discuss with the children the effect the crowding has on their trying to learn.

b. With their parents' permission ask the children to not eat breakfast and have just a cup of water and a slice of bread for lunch. Discuss if their being hungry affects their ability to think and learn. Relate this to people in other countries.

c. Form committees and have each group look up a medical discovery in their lifetime that has helped prolong lives (Polio, heart, smallpox, etc.)

d. Find out how many children are in each family as compared with number of children in their parents' families and grandparents. Discuss this in relation to number born and died. The fact is that most pioneer families had lots of children because so many died and they needed them to help on the farm.

e. Using the room as an example figure up how many children would be in the room if each had two children and their children each had two.

PURPOSE: To study various types of visual pollution.

LEVEL: 4-6

SUBJECT: Social Studies
Language Arts

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Aesthetic considerations; visual pollution

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN. Title III ESEA.

ACTIVITY: Pollution is a word that can mean many things. It should mean that something is not fit for a particular purpose. Visual pollution would therefore mean that there is not scenic beauty or visual pleasure. Most people accept things as they are; they may think some are pretty and some are ugly, and not all people agree on the meaning of these terms. We usually notice things in our surroundings of past experience or present interest. If we are driving and are hungry we notice restaurant signs, if we like horses we will notice horses as we drive.

The concern today is over the amount of visual pollution that should be allowed. Some feel that no signs should be placed along highways but others enjoy reading them. Without the signs the business would not be able to attract customers. Some suggestions have included certain areas with signs instead of spreading them along the highways. Some government agencies have an agreement with landowners not to erect signs on their property. This is an easement.

It is not only signs that are visual pollution but lines and poles. More and more areas are putting electric and telephone lines underground. At one time this was too costly but today, in most areas, the cost is about the same. There are some areas where this could not be done but where it could be this would greatly help the looks of any area.

Junkyards and dumps have long been an eyesore. Too often the first thing out-of-towners see as they enter a city are large car junkyards. In many areas the junkyard must be fenced and something used to screen off the sight. This, of course, does not help the land pollution that is occurring with the junkyards and dumps but it does help the view.

Strip mines and quarries are very evident in some parts of the country. Today very strict laws are being passed that

will help this situation. In the past many mining companies merely left the exposed land. Today they are being required to replant the land with trees and grass. This, in time, will help erase this problem. New highways are being built all the time and they, too, expose the bare ground. A highway is not considered finished now unless the sides have been planted, not only for beauty but for the erosion problem.

Old buildings are another eyesore, particularly in the urban areas. Many people cannot afford to paint their houses or keep the yards in good condition. Certain parts of towns, soon overcrowded, become visual pollution at its worst.

Some landlords do not attempt to keep up the rental property and the tenants are unable to fix them. New laws are requiring that areas be kept in better condition and often city or community fix-up paint-up campaigns can help spur residents to take care of the area.

The visual pollution problem is not an easy one. To many interests are involved in it. People are beginning to want beauty, to want better looking and better styled signs put in fewer places. It will take everybody working together deciding that the environment must be pleasing to look at as well as a pleasing place in which to live if this problem is to be solved.

The following are activities to look at various types of visual pollution:

1. Have the students survey signs and advertisements in their own community. Have them list how many they see, where they are located and whether or not they are pleasing. Show pictures of different things to the students and have them rate if they are pleasing, slightly pleasing or not pleasing. Discuss the different opinions.

2. Take several billboard signs that are erected in the community and ask the students if, just be seeing the billboard, they would buy that product or service. Discuss the answers. Relate this to TV commercials in the same manner.

3. Take a walk around the school building. Have the students list things on and around the building that are pleasing to them—that are unpleasing. See if the lists differ for different students.

4. Show pictures of different styles of houses. Ask what they like or dislike about each style.

5. Have as many children as possible who have a camera to take pictures of things that are pleasing-unpleasing. Put them up and discuss them. Be sure to stress that some man-made things can be very pleasing while some natural things are not pleasing. Discuss this in relation to people's background, etc. One example might be that a snake's movement and color can be very pleasing to some people while others cannot see this because they dislike snakes.

6. Check the costs of putting lines underground in the city. Would the students want the lines put underground? Ask them to get an opinion from their parents. Where would you not want lines above the ground? If it costs more to put them underground would it be worth the cost?

7. Ask the students to conduct a survey when they are out driving with their parents. Try to count how many signs different services or goods have. Does this have any effect on how you might feel about that service or goods? Would you be more likely to stop at a place that had many signs or would it irritate you so you would not ever stop there? Discuss the effect on business if the signs were removed. Do they serve a purpose? How can they be controlled and still serve a purpose?

8. If there is an area that is very bad about too many signs in the community, you might suggest that the students drive there with their parents to see this example of visual pollution and get their reactions and the reactions of the parents. Watch for letters to the Editor in the paper which often bring up this problem.

9. If certain signs are unpleasing to most of the class, you might write a letter to the company and tell them how you feel about the signs and what you might suggest as a change.

PURPOSE: To inquire about the past history of a local area and depict changes in life styles.

LEVEL: 4-6

SUBJECT: Language Arts
Social Studies

CONCEPT: All living things, including man, are continually evolving.

PROBLEM: Cultural considerations; effects of humans on ecosystem.

REFERENCE: Richard Ellis, Division of Environmental Planning, Tennessee Valley Authority, Chattanooga, Tennessee

ACTIVITY: The senior citizen has been an eye witness to many changes. Accounts, recollections, and anecdotes provided by elder long-term residents of an area may provide relevance to the discussion of urban change. If a senior citizen who has resided in the area for a long period lives nearby, he or she may be willing to speak to the class and answer questions concerning changes they have witnessed.

Among the possibilities of inquiry which these individuals may have witnessed are topics ranging from changing land use patterns to the demise of the elm tree, a favorite shade tree--common everywhere; a monoculture which succumbed to dutch elm disease.

Instruct students to write short essays on how their life style would have differed as young people during the speaker's youth. An alternate activity would be to make individual drawings or a class mural depicting the different man-made and natural local environment of the speaker's youth.

PURPOSE: To conduct a "hazard survey" in the school neighborhood.

LEVEL: 4-6

SUBJECT: Math
Social Studies
Health and Safety

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Health considerations

REFERENCE: Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN. Title III ESEA.

ACTIVITY: In many areas there are hazards that affect children walking to and from school. This is particularly true if there are no sidewalks. Other neighborhood problems might include dumps nearby, undesirable people living near the school, and heavy traffic problems.

If there are no sidewalks near the school, conduct a survey to determine where children are walking. If on edge or shoulder, is it wide enough? Do they fully understand the safety rules for walking on a road or highway and why? Make a car survey early in the morning and after school to determine about how many cars and trucks pass the school at the time the children are walking to school. Discuss who's responsibility would it be to put in sidewalks? (This is a debate now between schools and local government.) How far would it have to extend to be safe? (Measure the proposed area.) Would the sidewalk help the entire community? How many children in the school have to walk down the highway or road? What are their ages? Have any been hurt? What has held down the possible accidents? (Training and the patrol mothers and members.) How could a community get a sidewalk? (By working through the councilman, letters to authorities, and making the problem know.)

Often a fill or dump is put near a school or in the community. As a problem, this can be used for discussion and possible action.

Why is the dump necessary? (Trash must be put somewhere.) Why is it bad for the community? (Eyesore, possible source for rats; if burned, air pollution; if children play around it, they could be cut or injured.) If the dump was not

there, would that be a hardship to anyone? (The disposal of waste is a great problem. Some areas do not have a pick-up service and have no place other than a dump to bring their trash and garbage. Too many people, instead of taking the trash to a dump will drop it along the road, creating a hazard and a pollution problem. New ways MUST be found to dispose of trash.) What is the difference in a dump and a landfill? (A landfill usually has only trash, rocks, dirt, no garbage. Soil will be used to cover the area as soon as the depression has been filled. The land can then be used and much of the trash will go back to soil. A landfill is ONE method of using trash that can be good.) What can be done to have a dump removed? (It would have to be proved that it was a hazard to the community and since it might be necessary a new dumping place not so close to people living would have to be found.)

PURPOSE: To use natural elements in artistic ways.

LEVEL: 4-6

SUBJECT: Fine Arts

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts.

PROBLEM: Eco-Community relationships; natural resource use

REFERENCE: Dick Dye. Earth Art. Project ECO-logy, ESEA Title III. Highline Public Schools, Seattle Washington 98166

ACTIVITY: Make a watercolor wash. Pass out equipment: paper, watercolors, brushes, water pans. Keep the large utility sponges at the sink, or by a large pan of water if sink is not available.

a. Students take turns dampening their papers, with the large sponges

b. Place your wet paper in front of you in a vertical manner.

c. With a loaded brush of say magenta, or bright blue, etc. start painting the paper at the bottom going from side to side, working your way slowly up the paper. DO NOT SCRUB!

d. Periodically dip brush into plain water to lighten the charge of color you have been working with.

e. Eventually you will have a watercolor wash of one color that begins very strong at the bottom and gradually fades almost to no color at the top of the paper.

f. Make several of these. Try different colors. But keep the wash limited to one or two colors. If two colors are used be sure to blend them well.

g. Set the wash aside to dry in readiness for the next step.

h. Go for a walk and collect as many different types of grasses as you can find. Bring them back to the classroom (each child should have several examples).

i. Pour the India ink into containers (margarine tubs work very well for this—use one to every four students). Be ready to clean up any spills immediately as this type of ink stains quickly and permanently. Pass out the pen with holders.

j. Have the students examine the grasses and arrange them or spread them out on their desks. Sometimes it is nice to have a small jar to hold them (baby food jar).

k. Begin to draw the grasses in the center of the water wash. (Note the dark end of the paper can be either the top or bottom now.) Remind the students to start three or four inches in from the side and not to extend their drawings any farther than three or four inches from the top and bottom of the paper. If directions are followed the students will end up with what is called a "vignette" type of drawing. When matted they become very handsome, and all are usually successful. Let them experiment!

PURPOSE: To show the class that a balanced diet is important to growth and well-being.

LEVEL: 4-6

SUBJECT: Science
Health Education
Fine Arts

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Health considerations; food quality

REFERENCE: William Hendricks, Growth: Suggested Activities to Motivate the Teaching of Elementary Health, Educational Services, Inc., P.O. Box 219, Stevensville, Michigan 49127

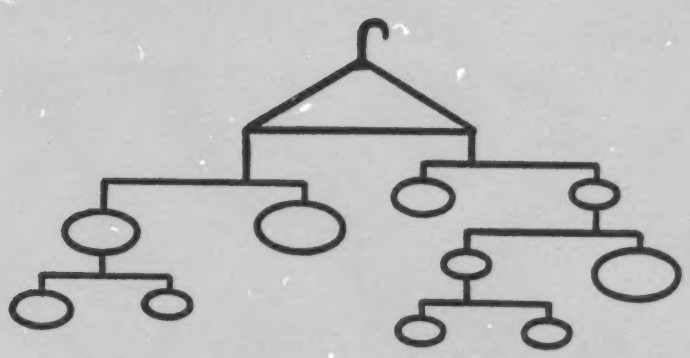
ACTIVITY: For this experiment you will need two cages, two white mice (gerbils or hamsters may be used as well), a scale, forms for recording growth and food for the animals.

Animals selected must be young, preferably just leaving the nursing stage and entering a rapid growth stage so impact of diet on growth can be measured. If fullgrown animals are used, differences in condition and temperament can be noted, but these are more difficult for children to distinguish.

Place one animal in each cage. Feed one a balanced diet, with foods from all food groups included. The other animal's diet should lack several food elements. For example, one could be fed milk, whole grain cereal and green lettuce. The other could be given only coke and white bread. The class could help decide on diets that they feel are well-balanced and those that are deficient. Weigh the animals daily and record their growth. Have the class also note the way the absence of a balanced diet affects behavior.

After the differences have been clearly established, reverse the diets for the two animals and note the differences that result.

Next, reinforce your pupils' knowledge of foods that make a good breakfast, lunch and dinner. Discuss the types of food necessary for a good breakfast. Cut out pictures of these foods and paste them on cardboard backgrounds. Make tiny holes near the top center to fasten the string. Work to develop a balanced mobile. Have groups work on mobiles for each meal.



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PURPOSE: To inquire into the historical background of your city.

LEVEL: 4-6

SUBJECT: Social Studies
Fine Arts
Language Arts

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Psychological and behavioral considerations; cultural considerations

REFERENCE: Richard A. Ellis, Division of Environmental Planning, Tennessee Valley Authority, Chattanooga, Tennessee

ACTIVITY: Examine street names, place names, etc. in your city. Many such names sound curious or incongruous in the context of the modern city. Many of these names were given when the environment of the specific location was quite different than it now is after land use and other man-made changes occurred as the city grew.

Old city plats or reference to local history writings may reveal what early residents saw in the area and why the place name may now seem illogical or even humorous. Local historical societies and/or history buffs usually welcome such inquiry and are bountiful sources of information.

After identifying some curious place names and inquiring into their history, ask students to compose contrasting pictures depicting the area when named and the area now. Alternatively, compositions may be written describing how the area was named and the changes occurring from then to the present which make the name seem out of place.

PURPOSE: To recycle paper.

LEVEL: 4-6

SUBJECT: Science
Math
Social Studies

CONCEPT: The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: Eco-Community relationships; natural resource use

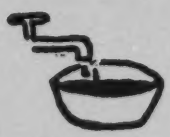
REFERENCE: Recycling Instructions reprinted with permission of: Environmental Action Coalition, 235 E. 49th Street, New York, New York

ACTIVITY: Ask your students to speculate how much paper they use in one day (napkins, lunch bags, school work, paper towels, paper cups, newspaper, etc.). What would life be like without all of these products? At this time, there are enough trees to make all of these paper products but we might not always have an abundant supply of trees. Used paper products can be made into usable paper. This is called recycling.

Recycle your own paper.

Materials needed:
- bucket or large bowl
- egg beater
- newspaper
- price of window screen about 4 inches square
- instant starch (this is not necessary but it will make the paper stronger)
- two or three used pieces of paper

Tear the paper into very small pieces. Put the small pieces in the bowl.



Fill the bowl with water. It is best to use warm water, if possible. If you want to use the starch, add two teaspoons of it to the water now.

Let the paper soak in the water for at least 10 minutes. Then beat it with the egg beater until it becomes soft and mushy. This is called "pulp".

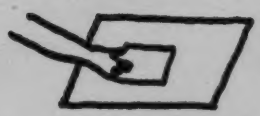
Dip the screen into the bowl carefully, tilting it so the edge goes in first. Then lift the screen up flat, letting the pulp cover the screen.

Let the water drip back into the bowl.

Turn the screen upside down on the newspaper. This has to be done carefully so the pulp doesn't all come apart.

Slowly and carefully take off the screen. Don't move the pulp! The pulp should stay on the newspaper.

Leave the pulp on the newspaper until it dries. When it is dry, you will have recycled paper!



Slowly take the recycled paper off the newspaper.

Of course, your recycled paper is much thicker and rougher than recycled paper made in a paper mill. It doesn't look like the recycled paper made commercially. This is because paper mills have all kinds of machines to make the paper smooth and flat.

7 - 9

ACTIVITIES

PURPOSE: To test for air pollution.

LEVEL: 7-9

SUBJECT: Science

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Aesthecic considerations; air particulate matter

REFERENCE: Lib Roller. Using the School and Community, Nashville Metro Schools Environmental Education Department, Nashville, TN.

Air acts to rid the earth of wastes. It acts in such a way that it makes itself pure. Today the air is in danger. We are putting more waste into the air than it can rid itself. This adding of waste material to the air is called pollution.

There are many ways in which the atmosphere becomes polluted. Some are caused by man and others come from the action of nature. A product of burning is carbon dioxide. All fuels which come from living, or once living matter, contain carbon dioxide. When they burn, carbon mixes with oxygen in the air to form carbon dioxide. Some carbon dioxide is taken out of the air by plants. Man has added to the amount of carbon dioxide in the air by large amounts. Since it traps the sun's rays, the temperature of the atmosphere rises. Scientists believe that if this goes on, many forms of life will not survive. Other things in the air are nitrogen; cars give off nitric oxide; some of these can be poisonous, some good. Some forms of sulfur in the air can harm eyes, skin, and lungs.

The air that makes city dwellers sneeze and wheeze cost every American $65 per year—a total of $11 billion in medical bills, corrosion, crop damage, cleaning, and so on. Can students cite examples of these expenses?

Scientists say that if air pollution is not halted by 1985 the amount of sunlight reaching the earth will be reduced by one-half. Today air pollution shuts out 45 percent of the sunlight over Los Angeles and 25 percent of it over New York City. An estimated 5 percent is shut out over rural areas. Have students discuss why this is so. They may want to guess how much sunlight their area receives.

When the atmosphere can no longer handle the waste, serious things can happen. Smog, a mixture of fog and smoke, often hangs over large cities. Air pollution can cause sickness and death.

ACTIVITY: Take a vacuum cleaner and put filter paper or disc over pipe where the bag would usually be. Use pipe without a fixture on the end.

Put cleaner with the pipe outside a window. Let it run for about one-half hour. Do the same with several windows around the school. Try it at different times of the day and in different kinds of weather. If possible, by using an extension cord, put the cleaner out away from the building toward a street. (Can be done during play period so someone can watch it.)

Compare the filters taken from each of the times, different days and different times of the day and answer the following questions:

At what time of day does the filter show more pollution? Why? (If in the morning, more cars on the roads. Sun has not heated up the air so that dust, etc., will rise.)

Was there any area of the school that had more pollution? Why? (This might be near a street or a house burning trash, etc.)

Are there any stores, factories in the area that might make more pollution for this area? (Check and use smoke chart.)

Does weather have anything to do with air pollution? (On windy or wet days there will be less pollution in the air.)

Can you <u>see</u> the pollution? (In some schools the "cloud" over Nashville can be seen very well, particularly in the early morning.)

Would certain times of year be more likely to have pollution? (Winter, because of fires and coal burning.)

Put the cleaner next to a car exhaust pipe and run it for awhile. Try several cars. Answer the following:

What makes the filter so dirty? (Lead in the gas and other chemicals.)

Would a bus or truck have more pollution than a car? (Yes)

How could car pollution be made better? (New types of cars, electric or steam, less driving by one or two people, more mass transportation.)

Some discussion here on why the new types of cars would be hard to use. See current materials in papers and magazines for articles on possible new cars. Suggestions on taking lead from gas or new ways to stop the pollution. Sixty percent of air pollution comes from the car.

PURPOSE: To be able to identify foods from various food groups and to consider which foods provide the most nutritional value for the cost involved.

LEVEL: 7-9

SUBJECT: Science
Health Education

CONCEPT: An organism is the product of its heredity and environment.

PROBLEM: Health considerations; food quality.

REFERENCE: William Hendricks. Growth: Suggested Activities to Motivate the Teaching of Elementary Health, Educational Services, Inc., P.O. Box 219, Stevensville, MI 49127.

ACTIVITY: Supply a chart to each pupil that has four squares entitled: breakfast, lunch, dinner (or supper) and snacks, for each day of the week.

After studying and discussing the food groups and the need for a balanced diet, have pupils plan their menus for one week. When they have completed their charts, check to see if all food groups are represented each day.

Incorporate a study of calorie value into the project. Using a chart showing the calorie value of various food portions, have pupils total the calorie count for each meal and day to see that the proper amount for their age and weight is included.

Obtain a number of menus from various types of restaurants. Display on the bulletin board the menus you have obtained. Example of a caption title could be:

WHAT SHALL WE ORDER?
or YOUR ORDER, PLEASE!

Have pupils select their food with each spending approximately the same amount of money. Discuss the wisdom of the choices made. Use the following questions as discussion starters:

1. What food groups were represented in the various orders?
2. Why do people eat the foods they do?
3. What order really was the best "buy" or value for the money spent?

Include a discussion about manners when eating in restaurants.

In connection with a school field trip or outing, arrange to have your class eat in a restaurant to put their knowledge into action.

PURPOSE: To use observational and interpretation techniques to make predictions about the future.

LEVEL: 7-9

SUBJECT: Science

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Eco-Community relationships; ecological considerations

REFERENCE: Earth Science Activities Manual, State Department of Education, Albany, New York

ACTIVITY: Divide your class into groups of four or five. Ask each group to go outside and find a puddle and:

1. Carefully examine the puddle with their senses and record their observations.

2. Use their observations to explain, to the best of their ability, what has happened at the puddle site to make it appear as it now does.

3. Use their observations and interpretations to make predictions about the future of the puddle site.

Allow 20-25 minutes observation and recording time at the puddle site.

The following is a list of some of the questions you may wish each group to consider about their puddle:

1. Define "puddle". What factors influence the life history of a puddle?

2. Are there any inlets or outlets?

3. Has deposition or erosion taken place in the puddle? Both, one, or neither? On what evidence do you base your response?

4. Has it rained since the puddle dried up?

5. Have there been any strong winds?

6. What evidence is there of the presence of animals at or near the puddle site?

7. Is your puddle an indication of something that may have harmful effects for the area in the future.

Note: You may wish to give each group a list of possible questions to take with them.

Upon the groups' return, ask each to appoint a reporter and report findings to the other groups. Allow questions from the rest of the class during this procedure. Discuss which of the "findings" are inferences and which are observations.

PURPOSE: To investigate the school's heating plant.

LEVEL: 7-9

SUBJECT: Science

CONCEPT: The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: Eco-Community relationships; natural resource use and aesthetic considerations; air particulate matter

REFERENCE: Charles E. Roth, Director of Education, and Miriam Dickey, Massachusetts Audubon Society, Lincoln, MA.

ACTIVITY: Trip to the Basement

One of the causes of air pollution is the incomplete combustion of fuels. How is your school heated? With coal? With fuel oil? "Let's find out" might lead to a trip to the school's heating plant.

Why is this particular fuel used? How complete is its combustion? Is the school's heating plant contributing an unnecessary amount of soot to the air? How is the heat from the boiler in the basement transmitted to the rest of the building?

You might also elicit from your students that saving of fuel and, incidentally, the lowering of fuel bills may be brought about by preventing the leakage of heat through good insulation of the school building.

On another trip you might want to investigate how and where water enters and leaves the school building.

PURPOSE: To utilize snow as a study in basic geology.

LEVEL: 7-9

SUBJECT: Science

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Eco-Community relationships; ecological considerations

REFERENCE: Charles E. Roth, Director of Education, and Miriam Dickey, Massachusetts Audubon Society, Lincoln, MA.

ACTIVITY: If snow is on the ground, it is time to initiate these snow studies, or perhaps we should say studies in basic geology. What are the three states of matter? Which form is water in when it appears as snow? Does snow have a crystal pattern? (You can study this with a hand lens in the school yard before going on this trip. Go out when snow is falling and examine snowflakes as they fall on your coat sleeve.) Is snow a mineral? Can we consider snow to be a rock composed of only one mineral?

Consideration of snow as a rock helps us to see geological processes in action. Why is the surface of the snow not pure white? Where did these particles come from? Cut down through a snow-covered area carefully. Can you see thin, dark lines where this material has accumulated after each snowfall? Notice how the newest snow tends to be loose and rather unconsolidated, composed of free sediment. Seeing layer upon layer like this indicates that this could be classified as what kind of rock—igneous, sedimentary, or metamorphic?

Look closely at the snow at the surface and at the bottom of your cut. Does it seem to have a different texture? What geological process is going on here? In terms of forms of water what "rock" do you suppose will result if enough pressure is applied? Make a snowball and squeeze it as tightly as you possibly can. Cut it in half. Were you right?

As you look about you will notice that the snow is deeper in some spots than in others. What kinds of erosion are there? Is the force that moves this snow around one of them? What great American tragedy was caused by this kind of erosion? This correlation is most apparent on a cold, windy day following a powdery snowfall. Be on the lookout for this after your trip.

Collect a cubic foot of snow to take back with you. Melt it down. How much water do you get? Let it evaporate. What is left? Where did it come from?

Pure water is neither acid nor basic. Chemical pollution in the air changes this. Test some of your melted water with pH paper or litmus. Do you have pure water? Could this be harmful?

Snow is important in helping many animals survive the winter. With a thermometer, record the air temperature. Record temperatures on the ground under the snow cover. Do this in several different places. What is the role of a snow blanket in helping buried insects and other creatures survive? Is the term snow "blanket" a good one? Does frost penetrate the ground deeper where there is snow cover or where there is none? Can you prove this?

Stick one hand into a snow drift and hold the other up in the air. Which gets colder? Does this differ if you take your mittens off? From what you have observed do you think that an igloo is a fairly warm shelter? Pilots downed in the Arctic are advised to burrow in a snow bank. Why?

PURPOSE: To survey rock materials in the environment.

LEVEL: 7-9

SUBJECT: Science
Social Studies

CONCEPT: In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: Aesthetic considerations

ACTIVITY: Take a walk around the block, specifically looking at the rocks and rock materials in the buildings, vacant lots, gutters, driveways, streets, etc. Survey and record how often specific materials were utilized for construction in the area and for what purpose. Discuss why students think these particular materials were chosen. Cost? Availability? Aesthetic considerations? Were these wise choices at the time of construction? How old is the area? Look at the wear characteristics.

Check the bedrock of the area. Is there a correlation between the type of bedrock and the type of material used for construction? Are most of the materials native to the area, or were they shipped in from some other place? Speculate how far the materials had to travel.

If students were reconstructing the area now, what building materials would they use and why?

PURPOSE: To note the variety of chemicals commonly used in the household and recognize that some must be used with care.

LEVEL: 7-9

SUBJECT: Science
Social Studies

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Health Considerations

REFERENCE: Harold Grooms. Environmental Education Exercises, Jr. Hi., 8-7, Bourbon County Schools, Paris, KY, Nov. 1972. Title III ESEA.

ACTIVITY: Display a collection of empty boxes and bottles that contained chemicals found around the house such as detergent boxes, cleaners, paint removers, aspirin, bleach, ammonia and gasoline. Discuss how the product is used, what it is made of and whether they should be mixed.

Ask students to conduct a survey in their own homes to: 1) count/list the number of different cleaners and pesticides, 2) note any cautions or poison signs, 3) note antidotes listed, 4) advice for use, 5) flammable? inflammable? Report findings and make a display in the room.

List the pros and cons for using these products.
Ex: Pesticide

Pros--	Cons--
-kills disease	-may affect water quality
-makes crop yields higher important in increasing population	-may destroy soil
-makes the country more attractive	-may eventually harm human health
-kills weeds	

Divide class and set up a debate with each side presenting issues.

PURPOSE: To simulate the problems involved in group decision-making which is a part of the urban environment.

LEVEL: 7-9

SUBJECT: Social Studies

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Aesthetic considerations; air particulate matter and health considerations; air quality

REFERENCE: All Around You - An Environmental Study Guide, Bureau of Land Management, United States Dept. of the Interior, Washington, D.C.

ACTIVITY: Present the following problem to your class:

An industry in town is putting out great quantities of black smoke as a result of the burning of its waste products. The town is located in a valley which means the smoke is not blown away easily. A group in town has formed to stop pollution of the air. This group is complaining to the town council about the smoke problem.

The industry says it cannot afford to change its method of waste disposal. Other people in town oppose the control of the smoke because they feel it will discourage industry from moving to their town. They say it would prevent economic development.

Divide the class into the following groups: Town Council, industry representatives, Citizens for Clean Air, Citizens for Economic Development (see description in following paragraph).

Each group should meet and discuss what it wants the town council to do about the problem, and what the group thinks is needed to make this a better place to live. The ideas should be based upon some research into the problem, not just personal opinion. Elect a spokesman for each group to present its "case" to the town council when the class meets as a whole again.

The town council should elect one of its members to be in charge of the meeting. After listening to the representatives from the different organizations the town council should come up with a list of priorities, a list of what it is going to act upon first, second, etc. Your class may wish to invite a member of the real town council to meet with you and discuss your ideas.

Each group should be presented with the following descriptions:

1. Town Council.—This is the town's governing body which will decide whether the smoke pollution will be stopped. The purpose of the other groups is to persuade this council through their representatives that their position is correct.

2. Industry Representatives.—This group represents the industry which is causing the smoke pollution. They are naturally concerned with their interests and want to keep their profits at a maximum. However, they are interested in public opinion and may respond to public pressure. The group claims that their economic development will be harmed if strong controls on smoke emissions become law.

3. Citizens for Clean Air.—This group is determined to solve the smoke pollution problem as soon as possible. Its members believe that a clean environment is more important than a profitable industry in town. The group also believes that the waste product being burned could be put to valuable use. Most people in this group do not depend on the industry for their jobs.

4. Citizens for Economic Development.—This group is composed of businessmen and also people who work for the industry causing the smoke pollution. They are siding with the industrial group since they are concerned with the town's economy. However, this group realizes that environmental quality is important and might seek a slow, gradual solution to the problem so that the industry is not hurt.

PURPOSE: To make pupils aware of the many accidents that occur each day, some of their probable causes and ways in which they could be prevented.

LEVEL: 7-9

SUBJECT: Social Studies
Health Education

CONCEPT: An organism is the produce of its heredity and environment.

PROBLEM: Health considerations

REFERENCE: William Hendricks. Growth: Suggested Activities to Motivate the Teaching of Elementary Health. Educational Service, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: Place a caption on the bulletin board entitled ACCIDENTS IN THE NEWS and discuss with the class some of the types of accidents that occur each day, such as: traffic, industrial, home, recreation. Perhaps the bulletin board could be divided into sub-areas for each type of accident.

Have pupils bring newspaper clippings describing accidents and put them up in the designated section of the bulletin board.

When the pupils put clippings on the board, have them suggest ways in which the accidents could have been prevented.

Appoint a committee to keep a record of the possible cost of all the accidents that are reported on the newspaper clippings brought in during the course of one week.

PURPOSE: To encourage students to conserve energy.

LEVEL: 7-9

SUBJECT: Social Studies

CONCEPT: The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: Eco-Community relationships; energy production

REFERENCE: All Around You—An Environmental Guide, Bureau of Land Management, U.S. Dept. of the Interior, Washington, D.C.

ACTIVITY: Chart the class's daily uses of electricity, by use and purpose. How many of these could you do without and still lead a comfortable life? What causes power shortages or brown-outs? How can power shortages be eliminated without building new plants? How are power shortages caused? What is your town's source of electrical energy? How is this produced? Does power production aggravate other problems?

How is your home heated? What is the source of this energy? Get some information on the amounts of different fuels consumed in order to heat buildings of similar size and construction at different temperatures. Will there always be enough of this fuel to heat homes? What can be done to decrease the use of this fuel? In ten years, with an increased population, what might happen to the demand for these fuels? What should be done?

PURPOSE: To identify agencies that provide special services in tenant-landlord conflicts.

LEVEL: 7-9

SUBJECT: Social Studies
Consumer Education

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Health considerations

ACTIVITY: As a group, list the responsibilities of tenants in an apartment dwelling (phone bills, keeping happs and stairs cleared, cleaning the apartment unit, etc.). Now prepare a list of landlord responsibilities (safe wiring, repairing plumbing leaks, cutting grass, setting limits on noise level, paying property taxes, etc.).

Discuss what can be done by either tenants or landlords if these responsibilities are not being met. What resource agencies exist in your city to aid the "injured" parties?

Provide the class with a situation such as the following: You live in an apartment complex. You pay your rent on time and abide by the conditions in your lease. Your landlord does not live in the complex. You have, for three months, been trying to get him to fix a leak in your bathroom, with no success. What options do you have other than to move or pay to have the leak fixed?

Appoint a student committee to look through the phone book for possible resource agencies and call to determine which can provide assistance in this matter.

Discuss the difference between city agencies and grass roots agencies (community groups, tenant unions, legal aid, etc.). Which are more accessible?

Is there more recourse for landlords than for tenants?

PURPOSE: To gather data to determine ratios of people and housing to business and industry in your school neighborhood.

LEVEL: 7-9

SUBJECT: Math
Social Studies

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Aesthetic considerations, city planning and convenience

REFERENCE: Our Man Made Environment: A Collection of Experiences, Resources, and Suggested Activities, Group for Environmental Education, Philadelphia, Pennsylvania, 1970.

ACTIVITY:

This exercise helps students become aware of their environment by forcing them to note certain things. This is the first exercise where students are to gather data for later use.

Prepare a large classroom map of your school district or area with street names included. Give each student a smaller copy of this map. Assign a two-block area to each student, close to his home, as his area of study.

Have the students decide symbols to be used for each building type or business type. Symbols should be meaningful to the students and make sure all the students understand the necessity of using the same symbols on all their maps.

Each student will be required to count and mark the different building types on the small map, using the symbols agreed on. Students should estimate the number of people living in a house, apartment building, and block. When these maps are completed—either as an outdoor assignment or homework assignment—include all information on the large classroom map. Total the number counts on the board or overhead projector so the students might see some relationships.

What ratios exist between the number of houses and gas stations? Between schools and churches? Between the number of people and bars? And so on. Ask the students if they are surprised at any of these numbers. Should the ratios be this way? Ask why there are stores and gas stations close by in some blocks but not in others. Ask what relationship playground size is to supermarket size. Would these relationships be the same any place in the city?

Have the students identify some buildings or services that are not included in their map area. What things are still needed? What would they change in their neighborhood and how would they change it? What side effects might there be?

PURPOSE: To examine various types of transportation in the urban environment.

LEVEL: 7-9

SUBJECT: Social Studies
Math

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Aesthetic considerations; traffic control

REFERENCE: Tobi Kipp Mills, Environmental Education Coordinator, New Lexington Schools, New Lexington, Ohio

ACTIVITY: Transportation is vital to the urban environment. Divide class into four teams and assign each team one of the following studies:

Team I - Car Transportation

1. Measure an average car, its width, length and height. How does the size of a car compare to the size of the street, parking space, curb, garage? If you had to design a road what would you do differently?

2. Interview some people who own cars. Where did they buy it; where do they keep it? How much money do they spend on their cars? Do they like it? Why or why not? List some reasons you think cars are necessary. List any city functions that are dependent upon cars. List some reasons that cars are not beneficial.

3. Talk to a parking lot attendant. How many cars are in the lot. What is the cost to part for five hours, for a day? Compare the cost of parking lot parking, parking meter parking, and riding a bus. Which is cheaper? What are the advantages of each?

4. Walk to a car dealers. How are cars sold? Are new or used cars more popular?

5. Visit a gas station. How has the energy crisis effected automobile transportation? How are repairs made on cars?

Team II - Bus Transportation

1. Visit a bus garage. Find out all you can about the size of buses, both inside and outside, how buses differ from cars. What determines bus routes?

2. Explore a bus stop. Why are they where they are? What are they like?

3. Talk to a bus driver. Why did he choose this job? What does he like about it? What are some of the problems he faces everyday?

4. Interview some people waiting for the bus at a bus stop. Where are they going? Do they ride buses frequently? Seldom?

5. Estimate how many people are on at least five buses. Was the bus full? Half full? Almost empty? Where do you think most of the people are going by just looking at the passengers?

Team III - Bicycles

1. Measure a bicycle, how does it compare to the size of a car? Measure a bicycle path, how does it compare to the size of a road?

2. How many different kinds of, not makes of, bicycles can you see? What are the differences and advantages of each?

3. Interview some bicyclers. Why do they ride? What do they like about their bikes? What are some problems for bicyclers?

4. What provisions are made for bicyclers in the urban environment?

5. Visit a bicycle shop. What are common repair or replacement items? How much do bikes cost? Repairs? Accessories?

Team IV - Car Pools

1. Tally how many of their classmates and families are involved in car pools. To school activities? To work?

2. Station the team near a busy intersection during rush hour. Have them count the number of cars that drive by. How many people are in each car? (In cars with several passengers, estimate which are families and which are probably car pools.)

Have each group report findings and observations. Discuss which methods use the most/least energy. List advantages and disadvantages of each method. Reflect how daily lives would change if we were suddenly forced to ration gas and had only half the amount available we now have.

You may wish to continue this activity by asking students to check with their parents or older brothers or sisters to find out how many miles per gallon are used by their cars. How much gasoline is used in one week? Calculate the amounts used in one month and one year. Compare different car models and years. Which use the fuel more efficiently?

PURPOSE: To investigate waste products in our daily lives.

LEVEL: 7-9

SUBJECT: Math
Social Studies

CONCEPT: The natural environment is irreplaceable.

PROBLEM: Eco-Community relationships; natural resource use and effects of humans on ecosystem

REFERENCE: All Around You—An Environmental Guide, Bureau of Land Management, U.S. Dept. of the Interior, Washington, D.C.

ACTIVITY: Waste, garbage, and trash—how do these products come into your home? Can they be reused or the amounts reduced? Of those things being thrown away, which ones originate from renewable and which from non-renewable resources? What might happen when all the non-renewable resources are used up? What replacements could be made?

Have students collect, bag, and weigh the waste from their homes for one week by different classifications such as glass, cans, food, and paper. How much garbage by weight does your household make in one year? Which type of waste is found in the biggest quantity? How often are pickups made? Is the garbage incinerated or buried? Does incineration make any other previously studied problems worse?

Here is a chart of the average percentage composite by weight of household garbage from twenty-one U.S. cities. Compare your percentages with these. How do you compare?

Food	18.2
Garden	7.9
Paper	43.8
Metals	9.1
Glass, ceramics	9.0
Plastic, rubber, leather	3.0
Textiles	2.7
Wood	2.5
Rock, dirt, ash	3.7

PURPOSE: To plan a budget to develop a realistic look at what a family of four needs to spend for housing and food in your city.

LEVEL: 7-9

SUBJECT: Social Studies
Math
Home Economics

CONCEPT: Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

PROBLEM: Psychological and behavioral considerations; social aspects

REFERENCE: Margaret Skidmore and Kathie Mucilli. Cities Then and Now and Where Do We Go From Here. Project ECO-logy, Title III ESEA, Highline Public Schools, Seattle, WA 98166.

ACTIVITY: Instruct students to plan a budget for two different families of four people; husband, wife and two junior high age children. Take home pay is $150 a week and $300. Beside each item below, write the amount they think they would spend each week for their family on that particular item.

	$150.00	$300.00
Food bought at the grocery store and other household items	_____	_____
Food bought at lunch counters or restaurants	_____	_____
Clothing upkeep: laundry, cleaning and shoe repair	_____	_____
Soap, shaving equipment, toothpaste, hair cuts, other cosmetics	_____	_____
Public transportation: bus, subway, toll bridge	_____	_____
Car upkeep: gas, oil, service	_____	_____
Entertainment: movies, nights out	_____	_____
Gifts	_____	_____
Rent (divide by four to get weekly rent)	_____	_____
Phone	_____	_____
New clothes	_____	_____
Appliances and furniture	_____	_____

Doctor/dentist bill, medicine	_____	_____
Repair bills	_____	_____
Pocket money	_____	_____
TOTAL	_____	_____

After they complete this exercise, ask the students to check newspaper ads to determine how accurate they were in their estimates. Instruct them to readjust their budgets to the realistic prices they found.

Note.--The newspaper check should include real estate sections noting as to whether utilities are included in the rent and the local supermarkets for the following items:

- 1 lb. coffee
- 2 dozen eggs
- 2 lb. bacon
- 2 12-oz. orange juice/ other breakfast juice
- 2½ gal. 2% milk (all meals)
- 1 large box cereal
- 5 lb. orange/grapefruit/ banana/apple
- 3 loaves bread
- 2 cans tuna
- 2 lb. lunch meat
- 1 large jar pickles
- 2 large boxes potato chips
- 1 large bag of cookies
- 1 lb. jar jam
- 1 lb. tomatoes
- 1 lb. butter or margarine
- 1 bunch carrots
- 3 green peppers
- 1 pkg. bakery products
- 1 lb. peanut butter
- 5 lb. potatoes
- 1 lb. rice
- 1 lb. noodles
- 5 lb. canned vegetables (green beans, tomatoes, corn, peas, carrots, etc.)
- 1 3-lb. beef roast (rump, pot, chuck)
- 5 lb. hamburger
- 3 lb. pork (chops or roast)
- 2 lb. chicken (cut or whole)
- 1 lb. hot dogs
- 1 head lettuce
- 1 bunch celery
- 1 can cleanser
- 1 can toilet & bathroom cleaner
- 1 large container liquid detergent
- 1 large box washing detergent

What is the most and least you can pay for each item listed above? Also ask students to check for price of gas at local stations and cleaning for:

1	man's suit	_____
1	woman's dress	_____
1	winter coat	_____
1	pair slacks	_____
1	sweater	_____

Students should include some extras such as movie tickets, athletics, etc.

PURPOSE: To predict the amount of water needed in your city for the oncoming year.

LEVEL: 7-9

SUBJECT: Math

CONCEPT: In any environment, one component - like space, water, air, or food - may become a limiting factor.

PROBLEM: Eco-Community relationships; natural resource use

REFERENCE: All Around You - An Environmental Study Guide. Bureau of Land Management, U.S. Dept. of the Interior, Washington, D.C., 1973.

ACTIVITY: Water is a resource none of us can live without. Not only does it quench a thirst, it also goes into many of the foods we eat and is used in the production of the products we use. Water has endless uses and yet today we seem to be taking its availability for granted. As demands for water increase, we must utilize our water resources carefully since there is only so much available at any given time.

As a class, identify your city water resources. Graph average daily use through summer and winter. Have a representative from the city water division help them answer questions. Is the city water treated? If so, how? What are major uses in the city? How does the water smell, look, feel?

Have students find out how much water their household uses in a day. (You can figure out what the major uses of water in a household are by taking a few simple measurements. For example, a toilet uses about 7 gallons of water every time you flush it.) The following are suggestions to measure water use: bath or shower, clothes washer, personal consumption (drinking and cooking) and lawn or garden. Now, calculate the amount used in a month and year. On this basis predict the water needed in the entire city. Does the water leave the house in the same condition it came in with? How has it changed? What happens to it after it leaves the house? How is sewage treated?

PURPOSE: To graph population increases in the U.S. and investigate its effects on food and energy consumption.

LEVEL: 7-9

SUBJECT: Math

CONCEPT: Family planning and the limiting of family are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

PROBLEM: Population studies

REFERENCE: All Around You—An Environmental Study Guide, Bureau of Land Management, U.S. Dept. of the Interior, Washington, D.C.

ACTIVITY: Obtain information from an almanac for the years 1950-1970, on population, cars, total personal income in the U.S. Graph population versus cars, population versus total personal income, cars versus total personal income. What similarities and differences are there among the graph? Does the population change affect the number of cars or total personal income? What would the graph of population versus use of electricity look like? Find the information and graph it.

Now ask students to keep track of the types and amounts of food they consume in one week and calculate the amount they would need in one year. If the population rates should increase between 1970-1990 at the same level as between 1950-1970, how much more food would be needed based on their yearly food calculations. What other problem might we face if this should occur?

PURPOSE: To learn how to determine the number of kilowatt hours used in a home for a week and think of ways to conserve electricity.

LEVEL: 7-9

SUBJECT: Math
Science

CONCEPT: The management of natural resources to meet the needs of successive generations demands long-range planning.

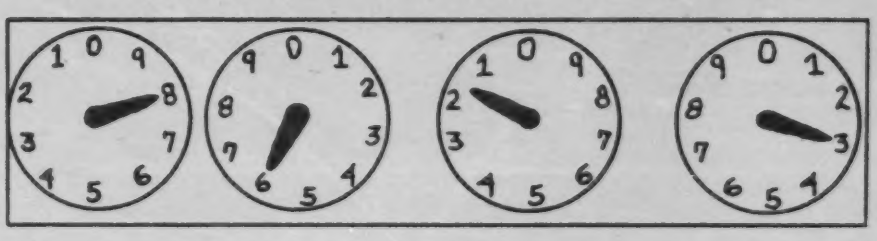
PROBLEM: Eco-Community relationships; natural resource use

REFERENCE: H. B. Lantz, Jr. Energy. Orange County ESEA, Title III Project. Orange, Virginia

ACTIVITY: On some wall of your home—basement, garage, or most often outside—you will find an intricate glass-enclosed device. Through your meter's glass enclosure, you can see a revolving aluminum disk and a series of dials and pointers, or digital numbers. Without explanation, they don't make much sense, but they are really quite simple.

The amount of electricity you use determines the speed at which the disk moves. The more electricity you use, the faster it turns. Each revolution represents a portion of an electric energy unit called watt-hour. This watt-hour measurement is transferred from the disk through a series of gears to the digital numbers or pointers on the dials.

Every hour a 100 watt light bulb burns, it uses 100 watt-hours of electric energy. Since a watt-hour is such a small unit of energy, your electric utility company uses a unit equal to 1,000 watt-hours—a kilowatt-hour—to measure the amount of electricity used. Most meters have four dials, though some commercial meters have five. On each dial is a pointer, pointing to a number on the dial. To record the meter reading, simply write down the number pointed to in each dial, starting from the right-hand dial and proceeding to the left. In the following example the reading is 8613. If the pointer is registering between two numbers on a dial, always record the smallest number. This is important.



8 6 1 3

Instruct each student to record the meter reading in his home for one week on the following chart. A place for entering the date and time of the reading is provided. A reading should be taken every day at about the same time in order to get 24-hour (one day) intervals.

The first reading is only a starting point, and cannot be used, by itself, for any comparison. This reading is entered in the space to the right of "First Reading".

When the second reading is made, the first reading is subtracted from it, the difference being the number of kilowatt hours used the first day. Enter the difference for each day in the "Difference" column. Similarly, when the third reading is made, the second reading is subtracted from it, and so on, always subtracting the previous day's reading from the current reading and recording the difference in the "Difference" column.

CHART FOR RECORDING METER READINGS

First Reading				
Time: Date:	_____	Difference		
Second Reading				
Time: Date:	_____	_____	=	Day 1
Third Reading				
Time: Date:	_____	_____	=	Day 2
Fourth Reading				
Time: Date:	_____	_____	=	Day 3
Fifth Reading				
Time: Date:	_____	_____	=	Day 4
Sixth Reading				
Time: Date:	_____	_____	=	Day 5
Seventh Reading				
Time: Date:	_____	_____	=	Day 6
Eighth Reading				
Time: Date:	_____	_____	=	Day 7
	Total	_____	=	One Week

Have students record and report totals for one week. The number of kilowatt-hours will likely vary from day to day. It will be interesting to try and account for any variations. Perhaps an increase in electricity use on Monday can be attricuted to washing and drying clothes. Find out who in the class uses the greatest amount of electricity; who uses the least. What is the family size of the larger user?

Now give students the following list of electrical appliances found in many homes and check the column that describes their attitude about doing without each item.

	Very Easily	Easily	With some difficulty	With great difficulty	Impossible
Radio					
Stereo					
Air conditioning at home					
Dishwasher					
Clothes washer					
Iron					
Electric stove					
Refrigerator					
Lights					
Central heating					
Doorbell					
Electric mixer					
Ice crusher					
Toaster					
Hair dryer					
Television					
Electric guitars					
Electric fans					
Clocks					
Vacuum cleaners					
Electric games					
Microwave oven					
Freezer					
Blender					
Electric blanket					
Typewriter					
Adding machine					
Dentist's drill					
Telephone					
Electric toothbrush					
Electric frying pan					
Hot water heater					
Garbage disposal					
Trash compactor					
Power tools					

Ask students to elicit cooperation from their families for one week to not use the items checked with some difficulty, easily and very easily.

Repeat the meter reading recordings during that week. Was there any difference on final totals? Whose family made the biggest conservation effort? See if this makes a difference on the monthly electric bill.

PURPOSE: To develop positive aspects of urban dwelling.

LEVEL: 7-9

SUBJECT: Language Arts

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Aesthetic considerations; recreational facilities

ACTIVITY: Ask each of your students to list five famous people in sports and the sport for which each is known. Using a reference such as:

Lincoln Library Sports Encyclopedia
Frontier Press
250 E. Town Street
Columbus, Ohio 43215

have them research each of their selected people to find out whether their sports "heroes" grew up in the city or in rural areas. Ask students to write a brief paragraph describing how each got his/her start in that particular sports activity.

As a class, list the sports activities and evaluate which need recreational facilities and special training more readily available to city youth. Which are group activities? Why would rural youth be at a disadvantage in these? In what kinds of sports activities do rural youth have an advantage?

PURPOSE: To assume responsibility for some of the environmental problems in the school neighborhood.

LEVEL: 7-9

SUBJECT: Language Arts
Social Studies

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.

PROBLEM: Aesthetic considerations; visual pollution

REFERENCE: Our Environment: A Collection of Lessons. Council on the Environment of New York City, 51 Chambers Street, New York, NY 10007, 1975.

ACTIVITY: Assign students (several weeks in advance) to take pictures of local environmental problems, such as abandoned cars, rubbish-filled lots, smoke stacks issuing forth black smoke, parks which need cleaning or are in total disrepair, etc.

When the pictures have been developed (use slides or prints—to show prints to the class use an opaque projector), show each of the pictures and discuss where the problem is (possibly mark the trouble spots on a map of the area); what the problem is; and a possible solution to the problem (one solution is to have students write letters to various officials enlisting their aid in helping to correct the problem).

Put the pictures on the bulletin board with copies of letters, written by the students, to the appropriate agencies or officials who could help remedy the situation. The replies received can be also placed on the bulletin board along with follow-up pictures if appropriate action has occurred.

PURPOSE: To compare "what's news" in the rural and suburban environments.

LEVEL: 7-9

SUBJECT: Language Arts
Social Studies

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Health considerations; medical treatment

ACTIVITY: Collect daily newspapers for one week. As a group, categorize the local events that make headlines. Now ask your students to write a statement describing a typical day in their lives. Compare their statements with the major local events collected from the newspaper. Does the newspaper actually describe urban living? Would someone, fifty years from now, know what life was like in your city if they only had today's newspaper as a reference?

Try to obtain a rural or suburban newspaper and compare typical headlines with those in a city newspaper. Does the rural or suburban paper more nearly describe the way people live in that particular community than does the city paper? What explanations can you give for the differences in the type of reporting?

PURPOSE: To show pupils that food products of similar price and appearance may have nutritional values that differ greatly.

LEVEL: 7-9

SUBJECT: Science
Language Arts
Health Education

CONCEPT: The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

PROBLEM: Health considerations; food quality

REFERENCE: William Hendricks, Growth: Suggested Activities to Motivate the Teaching of Elementary Health, Educational Services, Inc., P.O. Box 219, Stevensville, Michigan 49127

ACTIVITY: Collect labels from several "brand name" foods, such as: bread and cereal. Have pupils list the main ingredients and nutrients in each. Compare the lists and have pupils decide which brand provides the most nourishment for the selling price.

You may divide the class into groups giving each group the label of one brand of bread, one brand of cereal, etc. Then have them try to "sell" their brand to the class on the basis of the amount of nutritional value for the price.

Make a bulletin board display using the wrappers of various types of bread; white bread, whole wheat bread, rye bread or different brands to make the display colorful. Then have a committee study the contents as stated on the labels and report their findings to the class.

PURPOSE: To examine a variety of textures and their uses.

LEVEL: 7-9

SUBJECT: Fine Arts
Home Economics
Industrial Arts

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Aesthetic considerations; visual pollution and city planning and convenience

Psychological and behavioral considerations; cultural considerations and social aspects

ACTIVITY: Texture refers to surface contour. Discuss the importance of textures in food and clothing. Why are some food textures more appealing than others? What considerations about texture are important in choosing clothing? Furniture? List some products that incorporate textures for safety purposes such as concrete sidewalks—rough—to prevent slipping; drinking utensils —smooth—to protect lips.

Count and record different textures on your body and on your clothing. Which ones do you like best? Why? Least? Why?

A major characteristic of a city is its diversity—of people, colors, sizes, shapes, odors, sounds and textures. Take a walk and ask students to use crayons and paper to record different textures. Label each one and describe how it was used. Experiment with different textures of paper and implements (chalk, charcoal, wax, etc.) on one item. Does the texture change with different applications?

PURPOSE: To study ways to muffle highway sounds.

LEVEL: 7-9

SUBJECT: Fine Arts
Industrial Arts

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

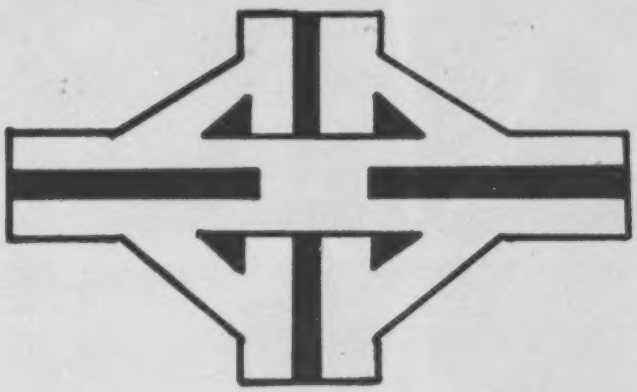
PROBLEM: Aesthetic considerations; noise and visual pollution

REFERENCE: Meet Me In St. Louie, Louie, But Leave Your Car At Home, Missouri State Department of Education, Jefferson City, Missouri, 1973. Title III ESEA.

ACTIVITY: Many things can be done to a highway to muffle its sounds from residents nearby. The level of the highway can be sunk below the surface of the surrounding area to direct noise upward and not into homes. Dense plantings of shrubs, bushes, and trees will serve to absorb unwanted sounds. Sloping walls at the side of roadways will help absorb and deflect noise. Quieter cars and greater use of city-wide transit systems will also eliminate unnecessary noise.

Show slide or pictures or take a walk to different roadways nearby and see if any of the above things have been done to freeways or busy streets. List as many of the above things and others that would influence the amount of sound reaching homes nearby.

Given the diagram below of a freeway interchange, design a landscape showing trees, shrubs and flowers that will enhance the beauty of the highway, cut down noise and increase safety. You may use a poster or even recreate this on a three-dimensional model.



10 - 12

ACTIVITIES

PURPOSE: To demonstrate harmful effects of ozone on rubber.

LEVEL: 10-12

SUBJECT: Science

CONCEPT: In any environment, one component—like space, water, air, or food—may become a limiting factor.

PROBLEM: Health considerations; air quality

REFERENCE: Denise Thompson. Air Pollution, What You Can and Can't See, Project ECO-logy, Title III ESEA, Highline Public Schools, P.O. Box 66100, Seattle, Washington 98166.

The major components of photochemical or Los Angeles type smog are oxidizing by nature, and are called oxidants. Ozone is an early and continuing produce of the photochemical smog reaction, and the presence of ozone in the air assures continuation of the oxidizing process. For these reasons, the term ozone is used almost interchangeably with the term oxidants.

It seems strange, but ozone generators are available that are supposed to eliminate odors and germs from the air. But it has been shown that the ozone concentrations produced by such equipment must be so large to be efficient (around 10 to 20 ppm) that it also would be rapidly fatal to human beings.

The following questions and answers provide background information about ozone and should probably precede the experimental activity:

1. What is necessary for the formation of photochemical (of L.A. type) smog?

   (sunlight and combustion products of organic fuels such as gasoline)

2. How would you describe ozone?

   a. color (colorless)
   b. odor (pungent)
   c. formula (O_3, an allotropic form of oxygen)

3. What are some of the effects of ozone?

   a. fabrics (damages fibers and discolors dyes)
   b. rubber (accelerates its cracking and checking)
   c. vegetation (damages leaves on at least 57 different species of leafy vegetables, field and forage crops, shrubs, and fruit and forest trees)
   d. people (severely irritates mucous membranes, produces coughing, choking, headaches and severe fatigue, and at high levels can interfere with lung functions during exposure and after)

4. What is the legal maximum allowable ozone concentration that a worker can be exposed to over an eight-hour period?

   (0.1 ppm)

5. What are some natural sources (that is not man-made) of ozone?

   (solar radiation and lightning)

You will need the following materials to conduct experiments on the effects of ozone on rubber—that of its accelerating the cracking and checking of rubber:

1. Rubber strips, ozone-sensitive, Goodyear Specification No. 563-27303, same as supplied for U.S. Public Health Service order #20374 of April 27, 1965 (order from local Goodyear District Sales Office or Goodyear Tire and Rubber Co., 1356 Tennessee Avenue, Cincinnati, Ohio; mark for the attention of Mr. B. L. Mattingly at the Goodyear Los Angeles plant—$1.00 per 9" x 9" sheet).

2. Two (2) 5/8" medium binder clips, such as IPKO #5 or IDL #50, available from any office supply store.

3. Lead weight to attach to one binder clip; weight of lead and binder clip should be 375 grams.

4. Bottle for unexposed rubber strips, approximately 65mm high by 19mm in diameter.

5. A small shelter box, roughly a 20cm cube, with louvers to allow air to enter without exposing samples inside to strong sunlight, and with a hook on the ceiling from which to hang the rubber strips.

ACTIVITY:

1. Place the shelter box at a convenient, safe, and unobstructed spot, such as the roof of your school; it should be placed on a box or other support to keep it about 3/4 to 1 meter off of any surface.

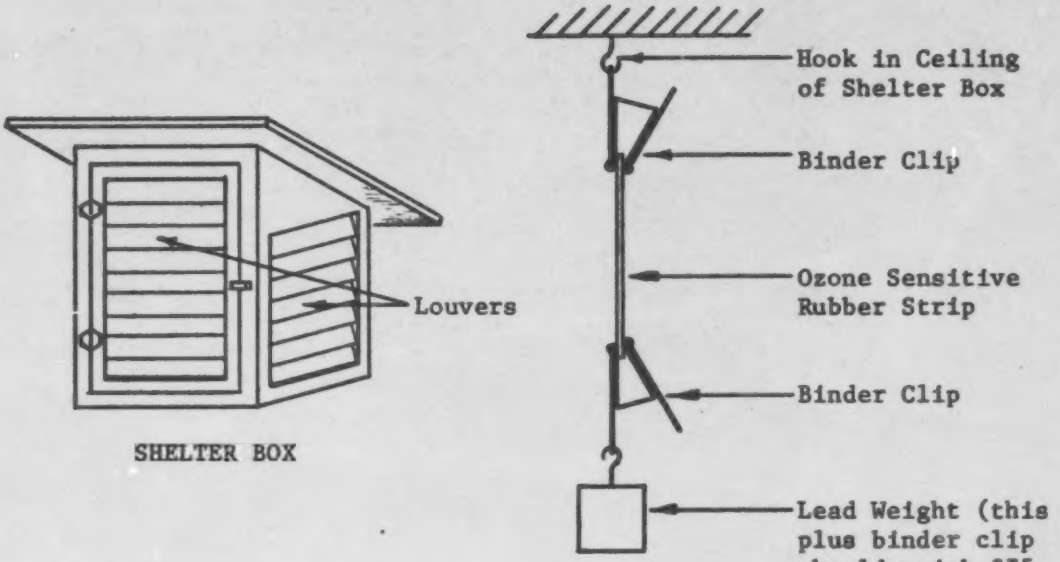
2. Cut the rubber sheet into strips 8mm x 50mm; place the strips in the bottle to protect them from exposure to ozone.

3. Remove one strip from the bottle and attach a binder clip, gripping the rubber 5mm from one end; hang the clip on the hook in the ceiling of the shelter.

4. Attach the other binder clip, again gripping the rubber 5mm from the end; hang the lead weight on the lower clip, putting the rubber between the clips under tension.

5. After seven days of exposure to atmosphere passing through the shelter, remove the rubber strip and examine it, while under tension, for degree of cracking or checking; if exposure of seven days is not sufficient to cause noticeable cracking or other degradation, the period of exposure should be extended.

6. At the end of the exposure period, remove the rubber strip and remove the clips from the strip; cut the strip longitudinally through the middle; place it under a 50 power microscope with a precalibrated eyepiece, and view the freshly cut edge; measure nine cracks, excluding any cracks within 10mm from either end, and report their average depth.



PURPOSE: To investigate solid wastes accumulation.

LEVEL: 10-12

SUBJECT: Science

CONCEPT: Man has been a factor affecting plant and animal succession and environmental processes.

PROBLEM: Health considerations

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

It has been estimated that 6 million cars go out of use every year and each urban resident throws away about 2,000 lbs. of rubbish and garbage each year. One report says that currently we are accumulating the fantastic sum of 360 million tons of solid wastes per year in the United States and spending at least $5 billion to collect and dispose of it. By 1980 these figures are expected to be three times greater.

The costs of collecting and disposing of our solid wastes are exceeded only by the costs for schools and roads. Few cities have approved, sanitary, and nuisance-free disposal methods. Open dumps are completely unsatisfactory, city incinerators contribute heavily to air pollution, and landfills have been used for longer terms than practicable and have deteriorated and polluted ground water supplies.

In addition to the obvious solid wastes picked up from residences, and automobiles and trucks, there are pathological wastes, explosives, building materials from construction and demolition, and slag from steel mills and mining operations.

Radioactive wastes may be gaseous, liquid, or solid. Some of these wastes are dispersed into the atmosphere or into streams where they continue to be radioactive for the life of the isotope. Many liquid wastes are concentrated and pumped into concrete-encased steel-lined tanks which are buried beneath the soil. Solid wastes are buried daily as they accumulate in nuclear research installations. The material is placed in containers which are then buried in shallow earth trenches beneath three feet of soil. Each isotope has its own rate of decay. No matter what the disposal, radiation from these wastes continues and may affect man later when the wastes are uncovered or the containers break open or rot away.

The Atomic Energy Commission (AEC) is working with 900 radioisotopes of 100 elements. Many of these isotopes perform useful tasks for us, and may solve some of our environmental problems when we learn to use them successfully. Weigh these benefits against the risks of damaged cells for present generations, and damaged genes which affect succeeding generations!

Charles H. Fox, author of an AEC booklet, Radioactive Wastes, has this to say: "Mankind needs the tremendous energy represented by nuclear fuels, but their use will create vast quantities of radioactive wastes. Disposal of these must never be allowed to harm man, his environment, or his natural resources."

ACTIVITY:

1. Report on the effectiveness of innovations in garbage and municipal wastes disposal, such as shipping from large cities to abandoned mines or piping material out to sea beyond the continental shelf.

2. Determine what laws or ordinances govern the handling of solid wastes in your community. Propose new ordinances or techniques for disposing of these wastes in a more effective manner.

3. If you live near a nuclear power plant, arrange a class visit to study the safety controls which prevent the contamination of air, water, and soil resources by waste products from the plant. How are employees protected from radiation hazards while disposing of wastes?

PURPOSE: To learn the effects of low level concentrations of carbon monoxide and measure its concentration in various locations.

LEVEL: 10-12

SUBJECT: Science

CONCEPT: Man has been a factor affecting plant and animal succession and environmental processes.

PROBLEM: Health considerations; air quality

REFERENCE: Dennis Thompson. Air Pollution, What You Can and Can't See. Project ECO-logy, Title III ESEA, Highline Public Schools, Seattle, WA 98166.

ACTIVITY: Materials Needed:

Eduquip Gas Sampling Kit for Carbon Monoxide (available from Eduquip Inc., 1220 Adams Street, Boston, Massachusetts 02124)

We know that carbon monoxide can be fatal in high concentrations; 1000 ppm can produce unconsciousness in 1 hour and death in 4 hours. But most studies by air pollution scientists are concerned with long-term effects of lesser concentrations of carbon monoxide. For example, the level of CO inside a car in heavy traffic on a multilane highway will be about 25 to 50 ppm; the concentration in tunnels can exceed 100 ppm.

Discuss the following with your class:

-*effects of contact with low level concentrations (100 ppm) of carbon monoxide* (fatigue, headaches, confusion and dizziness)

-*properties of carbon monoxide* (colorless, odorless, kills quickly at high concentrations, formula CO)

-*incomplete combustion of any carbon material is the process that produces CO*

-*prime sources of CO:*

a. transportation	63.8 million tons/year	nationwide
b. industrial processes	9.7 million tons/year	nationwide
c. solid waste disposal	7.8 million tons/year	nationwide
d. power plants and space heating	1.9 million tons/year	nationwide

-*how to eliminate CO*

(by making combustion processes more complete, such as external combustion and gas turbine power sources which utilize an excess of air; devices on internal combustion engines that oxidize the CO to CO_2 before being released to the atmosphere)

To measure the concentration of carbon monoxide in the air:

a. Carefully break both ends off of a detector tube using a pair of needle nose pliers or scissors; be careful not to cut yourself on the broken tips.

b. Place one end of the detector tube into the rubber bushing (stopper) and insert the syringe tip into the other end of the bushing.

c. Place the tube tip into the environment to be sampled, and pull the syringe plunger back slowly to the 25cc mark (take approximately 15 seconds to pull the plunger back).

d. If color change occurs, repeat step c. three more times.

e. Compare the color change with the chart enclosed with the tubes; if only 25cc of gas were analyzed, multiply the observed concentration by four; if 100cc of gas were analyzed, use the observed concentration as read directly off the chart.

f. If no color change occurs even after step c. has been performed four times, refer to the instructions supplied with the tubes for additional procedures.

Divide the class into small groups and instruct them to perform the carbon monoxide experiment in a number of locations such as:

a. the exhaust of an idling automobile
b. the exhaust of a cigarette
c. near a burning source
d. near the boiler smokestack of the school
e. near a heavily travelled street during rush hour.

Have each group report to the rest of the class their findings including description of the location, procedures, results and conclusions.

PURPOSE: To conduct an experiment on the effect of nitrogen dioxide on dyed fabrics.

LEVEL: 10-12

SUBJECT: Science

CONCEPT: Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a prticular objective.

PROBLEM: Health considerations

REFERENCE: Dennis Thompson. Air Pollution, What You Can and Can't See. Project ECO-logy, Title III ESEA, Highline Public Schools, Seattle, WA 98166.

ACTIVITY: Materials Needed:

1. American Association of Textile Chemists and Colorists (AATCC) Gas Fading Control Fabric—fastness to oxides of nitrogen (available from Test Fabrics, Inc., 55 Vandam Street, New York, N.Y. 10013—two 2" x 10 yd. rolls for $5.00)
2. cardboard frame for holding samples
3. contact adhesive for attaching samples to frames
4. small shelter box, similar to that for ozone deterioration of rubber experiment
5. (optional) AATCC Fabric for Color Fastness to Ozone (available from Test Fabrics, Inc., same address as above—two 2" x 10 yd. rolls for $7.50).

Nitric oxide, a relatively harmless product of burning fuels at high temperatures, can convert to nitrogen dioxide, especially when subjected to conditions that also form photochemical smog.

There are a number of oxides of nitrogen (NO_x), but the ones we are most interested in are nitric oxide and nitrogen dioxide.

Discuss the following:

--properties of these two gases:

Nitric Oxide (NO)	Nitrogen Dioxide (NO_2)
(colorless, no odor known, slightly toxic)	(yellow-brown in color, odor is pungent and sweetish, considerably toxic)

--the gases are formed as follows:

NO (combustion at high temperature such as in efficient combustion processes or processes at high pressures; i.e., automobile engines or electric power plants)

NO_2 (as a by-product of industry—fertilizer, explosives, etc.—or by oxidation of NO to NO_2—this occurs rapidly when high concentrations of NO occur in the air or when low concentrations are present with hydrocarbons and sunlight—photochemical smog conditions)

--effects of NO:

a. animals (harmful to lungs, decreases oxygen-carrying capacity of bloodstream, increases susceptibility to infection in lab experiments)

b. vegetation (causes visible harm and inhibits growth)

c. water (forms nitric acid; one possible reaction is:

$$H_2O + 3NO_2 \rightarrow 2HNO_3 + NO$$)

d. fabrics (discolors dyes)

--major sources of oxides of nitrogen:

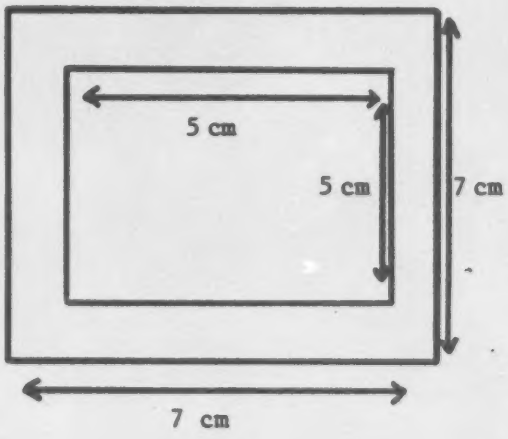
a.	power plants and space heating	10.0 million tons/year nationwide
b.	transportation	8.1 million tons/year nationwide
c.	solid waste disposal	0.6 million tons/year nationwide
d.	industrial processes	0.2 million tons/year nationwide

--ways to control production of nitrogen oxides:

(stationary sources—careful adjustment of flame and stack gas temperatures; automobiles—control is more difficult because reducing other pollutants can increase the output of nitrogen oxides)

Perform the following experiment to show the effects of NO_2 on dyed fabrics:

FRAME FOR FABRIC SAMPLES



a. Make a mount for each fabric sample by cutting a 5cm square window out of a 7 cm square piece of cardboard.

b. Place a 7cm square sample of fabric to be tested over the window, and fasten the four sides to the cardboard with the contact adhesive; make sure to mark the samples for later identification.

c. Punch a small hole in one corner of the cardboard frame, tie a length of string to the frame using the hole, and tie the other end of the string to a thumbtack or hook placed on the ceiling of the shelter; the mounted fabric should be hung to prevent strong sunlight from striking it.

d. After 90 days, remove the fabric samples and compare their color brightness with samples that have been sealed and stored to prevent exposure.

e. If a color-difference meter is available, its use would give quantitative results; such a meter is a photoelectric color instrument which measures incandescent light reflected at 45 degrees from the cloth sample; different fabric panels are measured for light reflectance through red, green, yellow and blue filters before and after exposure to obtain a total color difference.

PURPOSE: To observe the "vicious cycle" of interactions in human ecology.

LEVEL: 10-12

SUBJECT: Science
Health Education

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Eco-Community relationships; effects of humans on ecosystem

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

The human ecological system, involving man's internal and external environments in constant interplay, must be viewed as a gestalt. The human ecosystem is more than the powerful sum of all its parts—the parts that support man in his struggle for survival as well as the parts that threaten man with harm and death. There is constant, synergistic interaction between these separate parts. It should be obvious at this point that man dare not tamper with one part of his ecosystem without realizing that an effect will be exerted upon many other parts of the system.

Man can no longer approach his external environment with a plan for altering one phase of it—such as the use of a new chemical product to wash his dirty laundry—without determining how this product may affect his skin, the septic tank or the municipal sewage treatment facilities, and the resources for the community's drinking water.

Learning from bitter experience that a vicious cycle of interactions exists within the ecosystem, man then knows that he cannot alter his environment—internal or external—through a series of fragmentary and unrelated actions. Any action for good must be weighed against the potential for benefit or harm to the gestalt.

In this study, we are particularly concerned with substances which pollute man's environment and adversely affect his health. Some of these environmental pollutants reach every person, just as surely as sunshine and air and food reach that person. Many, many pollutants reach others with tremendous impact on their lives. René Dubos has stated the problem concisely: "The effects of the potentially dangerous products with which modern man now comes in daily contact . . encompass the whole gamut of toxicology from acute poisoning to carcinogenesis, from chronic respiratory impairments to mental disorders."

Dr. Frederick Sargent reminds us that we must maintain ecological perspective. "Man alone is not at risk: the entire biota is at risk from deterioration of the quality of the environment . . ." Man is only one of many living species and is dependent upon the biological productivity of the biota for his survival. "Consequently, his strategy must focus on the ecosystem." Man must work toward establishing the quality of the environment most suitable for all living organisms, remembering that these organisms play a role in determining this quality. It is then that we have a fit environment for all members of the ecosystem.

ACTIVITY:

1. Prepare a research paper which details the cumulative effects of lead, a component of many consumer products, on the human body. Prepare a cyclical picture, similar to the transparency, which tells the story of the interactions of lead with other factors in man's environment. (Other suggested chemical pollutants to be researched: arsenic, oxides of sulfur, estrogens fed to cattle.)

2. Find two or more environmental factors which *interact* to produce an effect greater than the additive effect of the two. (Suggestions: heavy cigarette smoking by man and working daily in excessive amounts of dust; driver taking antihistamines for severe allergy and being caught in snowbound traffic for several hours in below freezing temperatures; New York City strike and walkout of garbage collectors and extreme summer heat.)

3. Arrange for a local professor or graduate student in ecology to conduct a field trip to an aquatic or terrestrial setting. Have him describe interrelationships and the concept of "ecosystems."

PURPOSE: To study interrelationships of man and his total environment.

LEVEL: 10-12

SUBJECT: Science

CONCEPT: Family planning and the limiting of family also are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

PROBLEM: Eco-Community relationships

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea and Febiger, 1974

The problems of the deteriorating quality of the environment are not confined to the United States but extend to global dimensions. The whole world-wide family of man shares with us the sunlight, air, water, and food of this planet's closed ecosystem. Radioactive or pesticidal pollutants which reach the upper air currents over the United States may fall on distant regions of the world. In some unexplained way, through air or water, DDT residues have been found in Antarctica. In the last two decades, the few military powers testing nuclear weapons spread radioactive fallout across the globe, killing organisms in areas close to the testing sites and creating biological risks for organisms elsewhere.

The threats of famine, war, overpopulation, poor distribution of population and resources, and decreasing supplies of potable water cannot affect one segment of the world's people without leaving a mark on the remaining segments. International travel and the constant mobility of people affect the transmission of disease to persons not formerly exposed, and therefore not immune, to certain disease organisms.

These are principally sociological problems and need world-wide attention.

Specialized agencies of the United Nations are involved in many problems of the environment. Worthy of special mention are the Food and Agriculture Organization (FAO), the World Health Organization (WHO), and the Children's Emergency Fund (UNICEF).

Under the Treaty of Geneva (or Geneva Convention), the International Red Cross Committee handles personal problems caused by warfare and expends much effort to relieve the agony of prisoners-of-war and their families. The League of Red Cross Societies coordinates peacetime activities of national Red Cross societies throughout the world to aid those people who suffer from pestilence, famine, fire, floods, and other national calamities.

In spite of the tremendous efforts being made by established international organizations, by governments, by religious institutions, and by voluntary agencies, the family of man faces environmental problems not yet understood, not yet conquered.

Potential aid to combat famine or disease oftimes arrives armed with the newest weapons of modern technology only to go down in defeat before an emergent enemy which thrives in the disturbed and unstable environment. The Special Supplement of Natural History magazine, February 1969, carries several research reports which indicate the importance of seeking an understanding of this ecosystem to which man belongs. Our attempts to improve the quality of life for mankind are shown to be "unforeseen international ecologic boomerangs" when we change organismal relationships in the environment without intimately understanding each organism and its ability to adapt to change.

The special supplement states that the African bushman has survived for centuries in his stable, but stringent, habitat simply because he has an "incredibly intimate understanding of his environment."

Man's survival today, in the midst of the rapid transformations which occur inside his mind and body and outside himself, demands that he achieve an intimate understanding of his total environment—the human ecological system. His ultimate survival will depend upon his ability to adapt to the transformations in himself and in his relationships with the external environment, while, at the same time, he is conserving an environment worthy of his arduous adaptations.

ACTIVITY:

1. Prepare a two-part paper on human ecology: the first part to consist of a discussion of human ecology as a concept, a way of looking at man in his environment; the second part to deal with a specific aspect of human ecology, e.g., global pollution, overpopulation and the distribution of people on the earth's surface, and the mobility of people.

2. Have a physician and a psychologist discuss how the human organism seeks to adapt to stress, and the consequences of maladaptation. Describe somatic and mental diseases in terms of environmental causation.

PURPOSE: To investigate food contamination.

LEVEL: 10-12

SUBJECT: Social Studies
Science
Health Education

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Health considerations; food quality

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

The handling of food and milk may produce contamination in a variety of ways at any point along the path from the planting of the seed to the delivery of the finished food to the consumer's table, whether at home, in a public eating place, or on an interstate carrier.

When considering the sources of contamination we must include the raw materials, animal, vegetable, or synthetic. Foods of animal and vegetable origin present the greatest danger for they may contain microbial flora or viable organisms, pesticide residues, or antibiotic residues (from growth promoters, or veterinary drugs given to poultry, cattle, lambs, or pigs).

Individuals employed in food processing plants or public eating places, as well as those who cook and serve food to a private family, are often the original source of bacteriological contamination. Unclean hands pass fecal contamination either directly to food by contact or indirectly by way of unclean equipment. The all-purpose wipe cloth, used to dry hands, wipe tables and utensils, and clean up food bits, is a real culprit.

The complete cleanliness of equipment used around food is of extreme importance in the prevention of contamination from bacteria, rodent and insect fragments, or other debris.

Most food components, and especially milk products, provide the required nutrients for bacterial growth, and unsanitary handling will introduce a number and variety of microorganisms, such as coliform bacteria, salmonellae, and staphylococci. Other bacteria and their toxins which contaminate food and cause illness are *Clostridium botulinum, Trichinella spiralis, Shigella,* and the aflatoxins. There can be viral contamination, also. As laboratory methods are developed for isolating and identifying viral contaminants, it seems likely that new hazards will be disclosed.

Bacteria flourish in a moist, nutritious environment under warm temperature conditions and will increase in numbers in direct relation to the time they enjoy these favorable conditions. Careful observations of time and temperature in the home kitchen, the public restaurant, as well as in the processing plant are of immense importance in preventing food contamination and resultant illnesses.

Many outbreaks of food poisoning are due to mishandling of clean, wholesome foods during the period of final preparation and serving. Until an appreciation of proper food handling and serving is learned by those who prepare our meals, outbreaks will continue, irrespective of the microbiological quality of the commercial products. Probably Grade A Milk maintains the highest quality standards of any food product.

Food trade associations occasionally organize industry-wide educational programs to teach good management, good employee habits, and to minimize the hidden hazard of microbiological contamination. Management has learned from Federal and State surveillance that it may have a bacteriological problem so serious as to require shutting down the plant and recalling every package from the market, without knowing that the problem exists.

Today mass production, coupled with our rapid transportation capability, practically insures that food contamination at any point before serving can endanger thousands of people. This is not confined to foods and milk but may become a problem with certain drugs, cosmetics, and medical devices which can carry contamination directly to the body and its tissues.

Radioactive fallout and other waterborne, airborne, and soil contaminants may enter the food chain in several ways. In speaking of environmental control, one must consider all types of contamination, but chiefly extraneous matter and microbial contamination in any given situation. Wherever you have one, you have the other.

It is man's responsibility to control the environment in which his food is grown, processed, and stored so that the food is wholesome and nutritious, and in plentiful supply. Hundreds of synthetic and naturally-occurring chemicals are added to various foods to preserve, color, flavor, or otherwise enhance their value to us. The addition of these chemicals brings potential hazards unless proper controls are employed. On the other hand, some food hazards today stem from the non-use of these same food additives, especially the chemical preservatives, or from improper processing which allow microbial infestation or spoilage. The challenge is to minimize the risks from the use of agricultural and food chemicals and yet assure maximum benefits from those chemicals which are determined safe

for use. The federal government cooperating with state and local governments maintains surveillance over the entire spectrum of food growing, processing, transporting, storing, packaging, and preparation for public consumption.

Inherent food contamination problems, and problems which will be difficult to eliminate as environmental threats, appear in these areas: (1) the growing use of precooked and/or frozen prepackaged convenience foods; (2) the widespread, often careless, use of pesticides and veterinary antibiotics; and (3) the development and use of dehydrated and synthetic foodstuffs for space travel, undersea living, warfare, and other exotic environments.

Man has been forced to accept partial defeat in his efforts to cope with the destruction of his seafood supply by pollutants in the water, and the occurrence of malnutrition and famine from the inadequate distribution of food to the world's exploding population.

ACTIVITY:

1. Have the school dietitian show and explain the sanitation procedures followed in the kitchen, storage area, and lunchroom.

2. At home, change several variables in the usual storage procedures for a small quantity of foods—such as raw potato, open canned milk, bread slice, custard, or ground meat. Destroy the food samples after three days of observation. Report on your observations. If possible, make microscopic studies of the foods before and after the storage test; compare with before-after studies when normal storage procedures are followed. What are your conclusions?

3. Discuss safe storage and use of foods on camping trips.

4. Summarize current reports regarding pesticides from magazines and professional periodicals, including publications from the Superintendent of Documents, U.S. Government Printing Office. Analyze statements about the effects of pesticides, particularly of DDT, on growing crops, fruits, animals, and humans.

5. Summarize current reports regarding substances added to food or sold for use in the preparation of food.

PURPOSE: To identify some of the concerns of regional planners.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: The management of natural resources to meet the needs of successive generations demands long-range planning.

PROBLEM: City planning and convenience

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea and Febiger, 1974

In the United States about 150 million people now live in cities and urban areas. Most of these cities are concentrated in strategic sections of our country rich in resources necessary for the growth of business and industry. In some sections, our cities are thought to be changing into megalopolises, or "strip cities" which are a long, narrow web of individual communities, towns, and other cities.

Jet passengers on a nighttime flight readily envision the potential megalopolis of the entire area from Boston to Washington and perhaps on to Richmond, Virginia; or from Milwaukee to Chicago continuing southeast into Indiana; or from Santa Barbara to San Diego.

A study of strip cities indicates that these areas seem to develop in the direction of the prevailing winds. Consequently, pollutants reaching the air in one part of the strip may easily drift down upon another part, another city, rather than being blown away over open country. Air pollution, in this case, is no longer one municipality's problem, but a problem for an entire region to consider.

The distant transportation of water to serve western cities has been a necessary practice for many years. One region is deprived of a source to furnish another region which might not survive without it. Los Angeles has three major sources of supply to meet its massive water needs, and is seeking further sources. A portion of its water comes from the Colorado River which belongs to four states other than California. The 300-mile aqueduct runs from the Parker Dam on Arizona's border south of the great Hoover Dam. Owens Valley, 340 miles upstate in California, furnishes a large portion of Los Angeles' water needs. It was necessary for the state to build still another aqueduct from the Sacramento River 444 miles from the city to augment supplies. The proposal has been made that Los Angeles and other parts of the arid Southwest tap the Columbia River, connect the proposed aqueduct to Lake Mead above Hoover Dam, and feed the new water supplies through existing systems in the Southwest.

In 1960 the Supreme Court forbade California to take additional water from the Colorado River: the resources were needed for the development of Arizona. And so work has begun on building the Feather River Project, tapping the Klamath River in Oregon, and eyeing the proposed tapping of the Columbia River still further north. Previously these rivers were being reserved for water needs after 1990.

Georg Borgstrom, in his recent book TOO MANY, comments on the winning of the West in the 19th century "by harsh adjustment of limited water supplies. Yet today," he says, "San Diego and Tucson hold almost world records for per capita domestic use of water. Western cities have not come to terms with their arid world."

Who can say that the quantity of water available for any city's needs is not a regional problem in most instances? Likewise, how about the quality of water? Most cities obtain their water from rivers, streams, and lakes which drain many square miles of land, flow past industrial sites miles upstream, and often carry the treated sewage of multiple towns along the way.

The threat of radioactive residues and overheated water in our streams is particularly great in the vicinity of nuclear power plants and production centers, and uranium mines. Such pollution affects the entire region served by the stream.

Under the Federal Water Pollution Control Act and its amendments, all the states and territories were given the option of preparing water quality standards for their interstate streams, rivers, lakes, and coastal waters or of possibly having the Federal Government do it for them. They elected to draft their own, subject to the approval of the Secretary of the Interior.

Other regional problems whose solutions may be shared by several local governments with state assistance are public transportation, noise abatement from jet aircraft, mental health facilities, traffic control on arterial highways, industrial zoning (for pollution control), suburban development, and general land use.

We must continue to find ways to preserve our environment from further desecration and to manage our precious resources not only for our own use but for the use of others who share the region with us.

ACTIVITY:

1. Conduct a field trip to both an urban and a rural setting. Have students look for and record factors in the physical and social environments that affect health and well-being.
2. Have a local planning or public health official discuss how these factors are taken into account in community and regional planning.

PURPOSE: To investigate the role of the federal government in the control of the environment.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Health considerations

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

Throughout the Federal government, agencies charged with such matters as public health, consumer protection, transportation, city planning, agriculture, and nature resources are thinking in terms of environmental impact. They are striving to reconcile their actions with some elusive principle of ecological wisdom. State and local governments have established programs to cope with various aspects of the environment which threaten the quality of American life. Universities and other private organizations have turned their attention toward helping man develop a more sensible use of his environment. Industry is showing increasing awareness of its responsibilities in environmental management.

All of these concerned groups are now recognizing that their areas of concern are part of a larger, more complex problem which will not yield to piecemeal solutions—the problem of maintaining an environment conducive to human health and well-being in a world undergoing profound and accelerating change.

A primary goal of the Department of Health, Education and Welfare (HEW) is to assure that the health and welfare of man will become, and remain, the chief focus of all actions affecting the environment.

The Department and its consultants developed what may be called "A Strategy for a Livable Environment." This is a strategy to improve the status of man within his ecosystem and to achieve the highest quality environment man is capable of achieving. The strategy includes a statement of tasks which should receive top priority if we are to establish a hospitable environment in which man can survive and also flourish.

The deteriorating quality of air is an immediate problem and should receive first priority. Excessive noise is an emerging problem and frequently becomes a portion of the task of urban

improvement. Other portions of urban improvement are levels of tolerance for crowding, congestion, odor, general stress, and accident threats at home, in recreation, and in traffic. Consumer protection is a large task concerning flammable clothing and toys, appliances, cosmetics, food, drugs, household chemicals, and poison control.

There can be no illusions about the difficulty of the many tasks ahead. The Department of HEW cannot manage the environment. No single agency of the Federal Government, or of private enterprise, can do so. But the Department can provide leadership to a national effort to protect the health and well-being of man, now and in the years to come. Participating in the national effort must be state and local governments, industry, research and development teams, national health agencies, professional organizations, and the universities.

Since the ultimate responsibility for improved maintenance and control of the environment rests with the individual citizen, there must be the reality of involvement of community-citizens and of all segments of our society.

ACTIVITY:

1. Discuss the organization and functions of these departments in the executive branch of the federal government: (1) Health, Education and Welfare; (2) Housing and Urban Development; (3) Interior; (4) Agriculture; (5) Transportation. Do these departments have local offices in your community? If so, learn how they cooperate with other agencies to help solve the environmental problems of your community.

2. Assign committees to draft legislation designed to improve the quality of the environment. Have each proposed Act reviewed by the class acting as a "committee of the whole." Send best regarded legislation to a state legislator or member of Congress.

PURPOSE: To examine some of the factors an individual should consider in making his own food selection.

LEVEL: 10-12

SUBJECT: Social Studies
Health Education
Home Economics

CONCEPT: An organism is the product of its heredity and environment.

PROBLEM: Health considerations; food quality

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

ACTIVITY: Discuss the recommended daily dietary allowances.

Chart nutritional values of fresh, frozen and canned products; various types of meats (canned, smoked, marinated).

Analyze "health foods" and compare to ordinary foods.

Develop a historical mural on food processing and preservation. (Refrigeration, dehydration, radiation, etc.)

Evaluate magazine and newspaper articles dealing with additives, pesticides and radioactive fallout in foods.

Compile list of factors that influence consumers in their food purchases.

Collect food advertisements and evaluate them in terms of nutrition and cost.

Determine costs of food by:

a) planning a week's menu on the amount of money welfare or retired people spend on food.

b) listing inexpensive substitutes for meats or inexpensive dishes that might help keep food costs down.

c) check U.S.D.A. commodities in use in the school lunch program and U.S.D.A. commodities available to welfare recipients...check food value.

d) collect recipes for surplus foods.

e) discuss food stamp program for welfare recipients.

f) determine cost of school lunch. Compare school lunch, home packed lunch, drive-in lunch, for cost, nutritional value, calories, satisfaction.

PURPOSE: To identify a variety of services available to the public through government agencies.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: Environmental management involves the application of knowledge from many different disciplines.

PROBLEM: Psychological and behavioral considerations

REFERENCE: Project Q.U.E.S.T., Brockton Public Schools, Brockton, Massachusetts. Title III ESEA.

ACTIVITY: Give students a list of types of problems that they and their neighbors might encumber. With the aid of telephone directories (especially Yellow Pages under GOVERNMENT section) have them identify the agency they would go to for assistance. At end of class, compare notes and clear up any confusion. This exercise proved helpful in making students aware of the many services available.

Sample List:

List the name and phone number of the community agency concerned with the problems listed below:

(use separate sheet of paper)

1. Your landlord has just raised the rent and you want to check if the increase is legal.
2. A friend suddenly chokes and seems to stop breathing.
3. You want to know who owns the vacant lot down the street.
4. Someone in your family is ill and medical bills need to be paid; money for food is tight.
5. You want to get your grandparents an apartment in one of the new elderly highrises.
6. You want to add a new room to your house.
7. You smell gas leaking in the air.
8. You see a power line dangling in the street.
9. Your tap water is rusty brown.
10. The drain in front of your home is overflowing.
11. You've seen rats in the basement of your apartment building.

12. You're with a friend who O.D.'s.

13. You need birth control and/or V.D. counseling.

14. You want help for your mentally retarded child.

15. You want to go back to work and need day care services for your children.

16. You're opening a new business and want some help in finding a good location for your store.

17. You want to use your house, in a residential area, as an office.

18. You want to register to vote.

19. You want to know who contributed to the mayoral campaign.

20. You want a map of the wards and precincts in Brockton.

21. You see someone dumping landfill into a swampy area.

22. You want to check on the legal boundaries of your property.

23. You want to learn who the past owners of your apartment building were.

24. You receive an excise tax bill for your car and think it is unfair.

25. You live near the urban renewal area and want to know the plans for your neighborhood.

PURPOSE: To identify the paradox of drugs in Human Ecology.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

PROBLEM: Psychological and behavioral considerations

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

Plants and animals survive through adaptive changes in their bodies or by their instincts. Man tries to impose his will on the environment and change it to suit his wishes, or else he attempts to alter his physical and mental self so that he can relate differently to his environment.

Our current pill-popping society has learned that man can indeed alter his physical symptoms or his mental attitude by taking one of the thousands of drug preparations available at the local pharmacy. René Dubos gives us food for thought in his book, MIRAGE OF HEALTH, when he says: "The modern American is encouraged to believe that money can create drugs for the cure of heart disease, cancer and mental disease, but he makes no worthwhile effort to recognize, let alone correct, the mismanagements of his everyday life that contribute to the high incidence of these conditions. Is it not a delusion to proclaim the present state of health as the best in the history of the world at a time when increasing numbers of persons . . . depend on drugs and on doctors for meeting the ordinary problems of everyday life? . . . All the separate problems of human health can and will eventually find their solution. But solving problems of disease is not the same as creating health and happiness. This task demands a kind of wisdom and vision which transcends specialized knowledge . . . and apprehends . . . the relation between living things and their total environment. Health and happiness are the expression of the manner in which the individual responds and adpts to the challenges that he meets in everyday life."

(Special attention should be given to the paradox presented by the use of the central nervous system drugs. These are the drugs which are abused so frequently today in an attempt to alter the mental self rather than face and solve life's problems without an artificial aid. For specific information and teaching resources see FDA's Life Protection Series, The Use and Misuse of Drugs, listed in the Resource Materials.)

It has long been recognized in the field of medicine that drugs for injection into the body and solutions for intravenous administration must be sterile. Sterilization of ophthalmic solutions and dispensers is also required to prevent eye infections. But no such microbiological requirements have been in effect for articles such as baby powders, oils, and bath preparations commonly used on the newborn; the hand and body lotions widely used in hospitals, the use of hexachlorophene in routine patient care; and similar items commonly applied on the body.

In the last three years or so, the public health implications of these latter categories of drugs and cosmetics have been of increasing concern to the government, industry, and trade associations of the United States and of most progressive countries, and also, of the World Health Organization.

Many varieties of yeasts, molds, and bacteria can cause decomposition, fermentation, off-odors, off-flavors, discoloration, or other changes in the physical nature of a product that detract from or destroy its consumer acceptance and in some instances affect its potency. In general, and following the analogy of food contamination, the broad sources of contamination of pharmaceutical preparations can be broken down into raw materials, water supply, air supply, processing operations, equipment, employees, and environment and plant facilities.

The important factors of potency, dosage requirements, and efficacy of drugs, and the problems of packaging and labeling products for safe use are outlined and developed for curriculum content in FDA's Life Protection Series, How Safe are Our Drugs? (see Resource Materials).

ACTIVITY:

1. Discuss personality and emotional problems which may lead to drug abuse, alcoholism, or other social adaptations. Discuss the pros and cons of handling those disorders as an illness or as a crime. Do the personal problems originally stem from stress received from the external environment? Do one's "social adaptations" further increase the environmental stress for others?

2. Review current professional and lay literature on drug research and the potential development of new drugs which will extend the life expectancy or enhance the health of individuals with diabetes, epilepsy, heart disease, tuberculosis, and leukemia.

PURPOSE: To discuss some of the factors that urban residents are forced to consider.

LEVEL: 10-12

SUBJECT: Social Studies

CONCEPT: The relationships between man and the natural environment are mediated by his culture.

PROBLEM: Psychological and behavioral considerations

REFERENCE: Morris Barrett, M.P.H. Health Education Guide. Philadelphia: Lea & Febiger, 1974

Just as the human ecological system is a gestalt, so is the city a gestalt in its own right. It is a whole organism greater than the sum of its many parts. Frequently, we think of our huge metropolitan areas as disaster areas, ghettos, too enmeshed in problems to be worthy of saving. Yet we know that our cities are the traditional centers of business and culture with dynamic interactions of persons, problems, and passions.

When we tackle the problems of the city, we have renewed opportunities to learn more about man and his relationships to his environment. Imperfections in the urban environment are indicative of basic imperfections in the total environment.

Such problems as unsafe housing conditions, rats, noise, overcrowding, unsafe streets, uncollected garbage, and inadequate community facilities become most acute in the inner portions of our great cities though they may blight any area. Every urban ghetto represents unnecessary failure of individuals and society to control the physical environment. Citizens of such areas need a great deal more care and training than normal, and our failure to help provide for their physical and mental well-being is reflected in sociocultural imperfections.

Persons who are fortunate to live in less blighted areas should know that compared to the general population of cities, ghetto residents suffer five to eight times as many burns, suffocations, accidental poisoning, and pedestrian injuries. Infant mortality in slums is three to five times the national average. Nationwide, one of five housing units has such deficiencies as inadequate plumbing or heating, or is structurally deteriorated and usually overcrowded. More than 14,000 rat bites are recorded every year. Garbage and trash mount, and municipal collection and disposal are often nonexistent.

In times past, urban problems were usually isolated from the problems of the countryside beyond the city limits. Today, with a proliferation of suburban bedrooms for workers commuting daily into the inner city to earn their livelihood, how can metropolitan social, political and economic problems be separated into urban and suburban factors?

The central core of the major cities is a prosperous business district. This core is surrounded by a ring of poverty and decay which gives way to a new widening ring of prosperous suburbs. Caught between the affluent outer ring and inner core is a high population density of the poverty-stricken whose community needs far outweigh their community resources. This situation aggravates other urban problems.

It is easy to catalog the defects of the city: it is not so easy to determine methods for saving the city and for enhancing the quality of the city's environment. It is generally conceded that the city will not be saved unless a large proportion of its citizens become concerned and fight for its survival. The struggle will demand that each citizen sacrifice a little individual freedom in order to save society from the impact of the city's environmental threats. One citizen might ask himself, "When does my freedom to burn leaves and garbage infringe upon the freedom of others to enjoy aesthetically pleasing and healthful environment?" The homeowner might ask, "Should I improve the plumbing and heating in my rental property before they completely break down?" The city officials may welcome the expansion of business and population because these increase the taxable base, but will the same officers change the pattern of environmental sanitation and garbage disposal to handle this expansion? Will improved sanitation be politically wise?

Individuals, groups of individuals, and businesses throughout the metropolitan area must sacrifice total freedom of action so that the sociologic unit—the city—may prosper and live a healthy and happy existence.

ACTIVITY:

1. Discuss how rapid population growth, urbanization, and industrialization are affecting man's ecology.
2. Have students identify changes that occur when a family moves from the farm to the city, and how these changes can affect health.
3. Discuss adaptation as a physiological and behavioral response to changes in the man-environment relationships.

PURPOSE: To encourage students to think about the quality of the environment's relationship with the way they live.

LEVEL: 10-12

SUBJECT: Language Arts

CONCEPT: The rate of change in an environment may exceed the rate of organism adaptation.

PROBLEM: Health considerations; air, water and food quality

REFERENCE: Trash, Our Only Growing Resource, Environmental Ecological Education Project, Missouri State Department of Education, Jefferson City, MO. 1973. Title III ESEA.

ACTIVITY: Discuss the meaning of terms such as pollution, environment, overpopulation, population control, conservation, survival, energy crisis, resources, recycling, sewage disposal, etc.

Ask your students to write an essay which includes:

> Detailing your desires for your life; i.e., what a quality life is to you. How many have a quality life as stated? What factors keep you from acquiring it? Pick one of the previously discussed environmental problems. Is it a threat to you? How do you know? Who can or should correct problems like these? Who owns the environment?

Propose one way to alleviate the environmental problem you choose.

PURPOSE: To weave grasses; a natural resource.

LEVEL: 10-12

SUBJECT: Fine Arts

CONCEPT: Living things are interdependent with one another and their environment.

PROBLEM: Eco-Community relationships; natural resource use

REFERENCE: Dick Dye. Earth Art. Project ECO-logy, ESEA Title III. Highline Public Schools, Seattle, Washington 98166

ACTIVITY: Grass is a versatile and useful plant. (A grass has a segmented stem. The base of each leaf wraps around the stem. The leaves alternate along the stem.)

Pass around examples of grasses: bamboo, corn, sugar cane, rice, wheat, oats, wild grasses, etc. Continue the above discussion about grasses. Outcomes might be:

a. Grasses are world wide, they grow everywhere. *Where don't they grow?*

b. Grasses feed the world—rice, wheat, oats, etc. *What cereals do you eat?* List some trade names under headings "Made from a grass," "Not made from a grass."

c. Grasses as bamboo are used for construction in some parts of the world for fences, screens, even houses —some timber bamboo gets to be 40 to 60 feet tall and eight inches in diameter.

d. Grasses are used for root coverings, floor coverings, and wall coverings, as woven mats, thatching, etc.

e. Grasses are woven into useful objects as clothing, furniture, toys, etc.

f. Grasses are used as an art and craft form.

To weave grass you will need the following materials:

-Variety of grasses—include corn stalk, bamboo pole, stalk of sugar cane if possible
-White drawing paper 12 x 18 is best, several per student
-Watercolor pans and brushes, one per student
-India ink (black) and something to hold a small amount of the ink for 2 to 4 students (margarine tubs are excellent)
-Pen holders and #B-6 size pen, one per student
-Water pans, one per student
-One or two large utility sponges
-Several packages of natural color raffia

-Several cones of jute in many colors
-An assortment of colors in various weights of yarn
-A cone of string
-Several branches broken to 8-10 inch lengths, two per student (Madrona is ideal)
-Large plastic tub for soaking the raffia

a. Begin by tying a branch to the back of a chair. See Fig. 1.

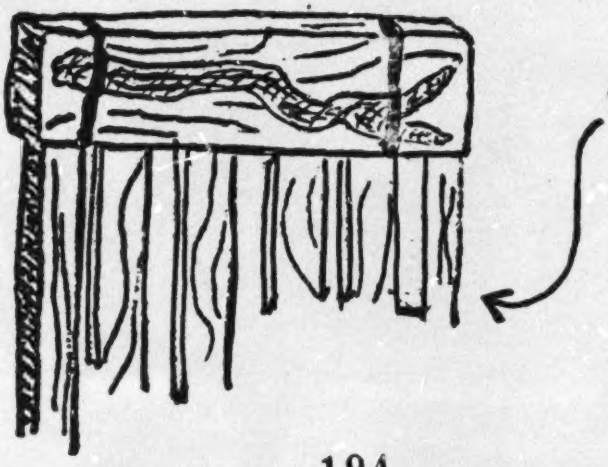
b. Tie on raffia, jute or string to the branch every half inch or so. These will become the warp of the loom or the part on which you weave. If you are using raffia it is advisable to let it soak for an hour before tying it on, otherwise, it may break on you. The length of each string should be as long as you want the weaving to be plus a few more inches you use up in tying around the two branches. See Fig. 2.

c. After all of the warp threads have been attached to the top branch, then attach the bottom branch in the same manner. Try to get all of the warp threads the same tension.

d. With your collected materials begin to weave your composition; over, under, over, under, etc. It is a good idea to weave a few times back and forth with yarn or jute after weaving in an object such as a heavy stick or piece of bark. Raffia can also be used for the weaving as well as for the warp threads. It will be easier if the weaving is begun at the bottom of the warp, however it can be started at the top.

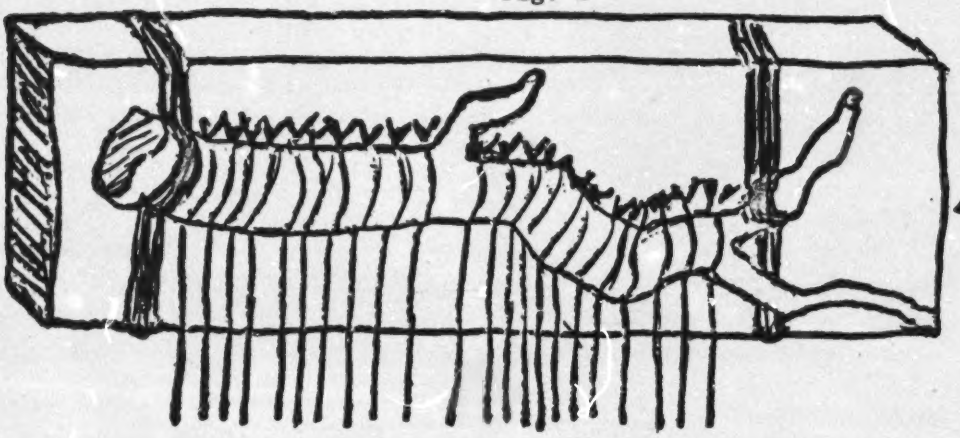
e. After the weaving has progressed for as long as wanted, remove the loom and display the loom and weaving together as one composition of wall hanging. REMEMBER DO NOT REMOVE THE BRANCHES FROM THE WEAVING AS YOUR EFFORTS MAY JUST FALL APART.

Fig. 1



(Tie the branch to the back of a chair before attaching the warp.)

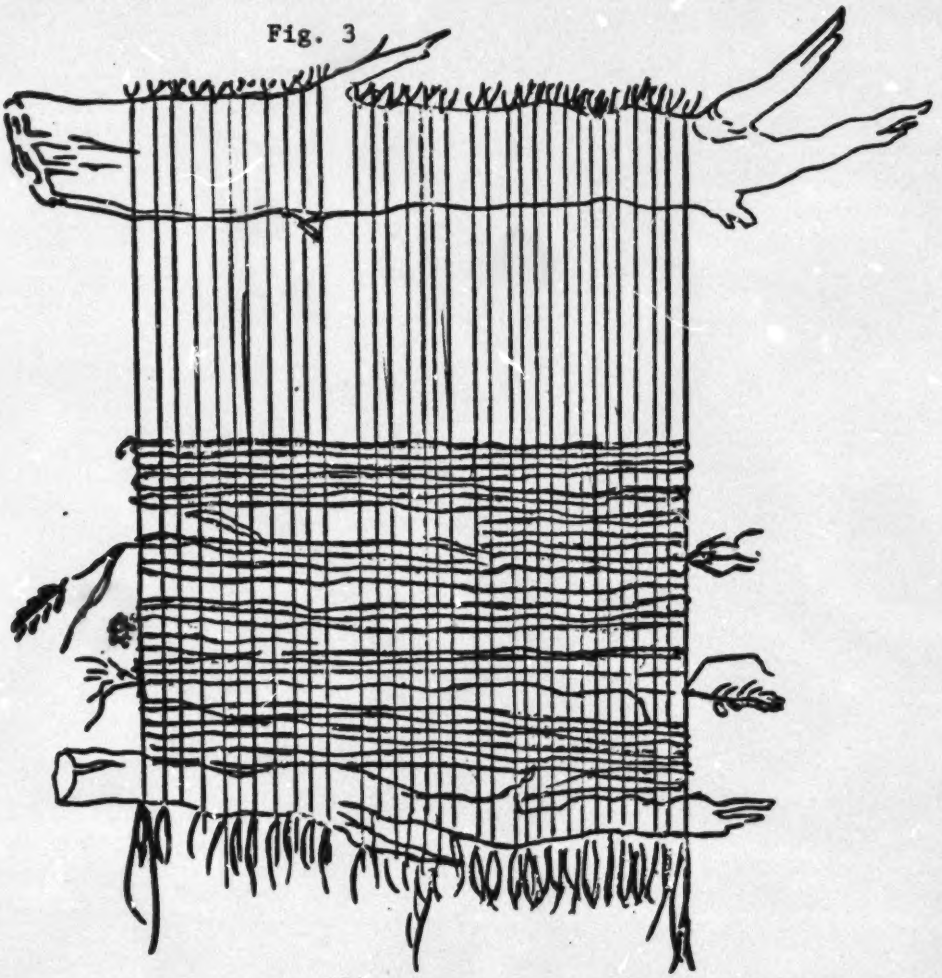
Fig. 2



f. When weaving in dried grasses, let the ends stick out. Try putting in some other types of dried flowers or weeds. Notice how the flower head sticks out in Fig. 3.

g. Try to keep from pulling in on the sides of your weaving, instead "lay the weave in." As you pull the thread through the warp hold on to the other side so that your warp does not become misshapen.

Fig. 3



An alternative weaving loom could be made from heavy chip board.

a. Cut the chip board into pieces 9 x 19 (this will give you six looms from a large 38 x 27 sheet of chip board).

b. Along the 9-inch side tape two layers of masking or book binding tape. Reinforce the corners also. See Fig. 4 and 5.

c. Using #3 size straight pins, pushed in along the taped edge every half inch or closer.

d. Warp with heavy string, jute or yarn. Bend the cardboard so that there is a bow in it before you begin to warp and then keep the bow by keeping the warp tight until it is finished and tied. See Fig. 6.

Fig. 4

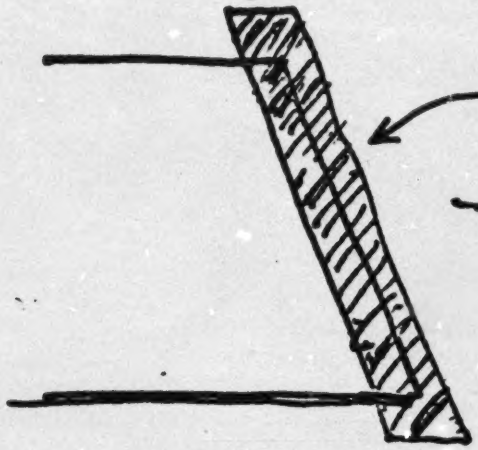


Fig. 5

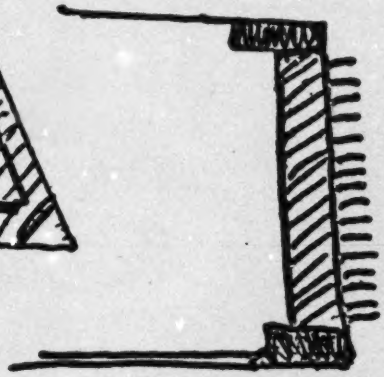
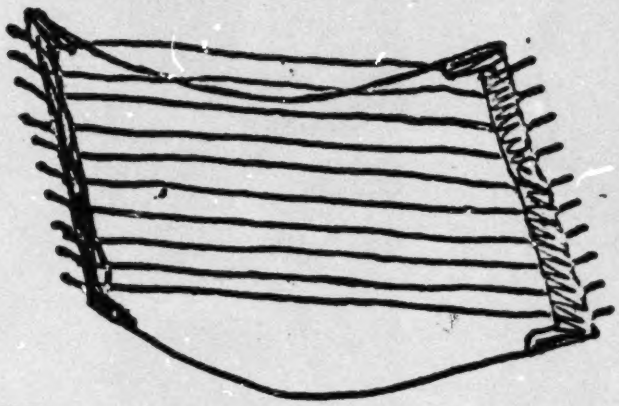


Fig. 6

The loom is kept in a bowed shape while the warp is being strung and tied.
DO NOT GO BEHIND THE LOOM WITH THE WARP!



Display the hangings, weavings.

PURPOSE: To design "inventions" that decrease problem urban noises.

LEVEL: 10-12

SUBJECT: Fine Arts
Industrial Arts
Science
Math

CONCEPT: Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.

PROBLEM: Aesthetic considerations; noise

ACTIVITY: Divide class into groups of four or five students and ask each group to choose one problem noise typical of urban areas. Each group is then charged with "inventing" some way to decrease the noise level by at least one-half. Groups are to: 1) produce a design and instructions for construction, 2) estimate cost of materials and production of their invention, 3) speculate who/how the costs might be met, 4) list possible side effects users might encounter. An example would be to design a portable soundproof tube to decrease the noise of a street air hammer.

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